# ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

SEPTEMBER 1957

PRICE ONE DOLLAR

FOUNDED 1866

# Abrasives-pumping question

## RUBBER-LINED pumps

## WHICH

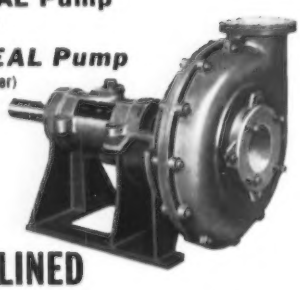
## ALL-METAL pumps

The proper application of rubber or metal wearing parts depends on particle size. Built for handling solids from 400-mesh to 1/4" size, Hydroseal and Centriseal split-shell pumps have wearing parts of Maximix rubber or neoprene – moulded to shape for locking into position mechanically and for easy replacement. Since solids over 1/4" diam. do not bounce off but tend to tear rubber, Hydroseal Sand & Dredge pumps have impellers, shells and suction sleeves made of the alloy most resistant under the wearing conditions.

**Interchangeable SPLIT-SHELL Design**

**HYDROSEAL Pump**
(Sealing water)

***CENTRISEAL Pump***
(No sealing water)



**RUBBER-LINED**

To select with ease the right pumps for your jobs, write us for our new Technical Data Brochure No. 357.

**HYDROSEAL**
**Sand & Dredge Pumps**

**ALL-METAL**

**THE ALLEN-SHERMAN-HOFF PUMP CO.**
**Dept. B—259 E. Lancaster Ave., Wynnewood, Pa.**
*Representatives throughout the World*

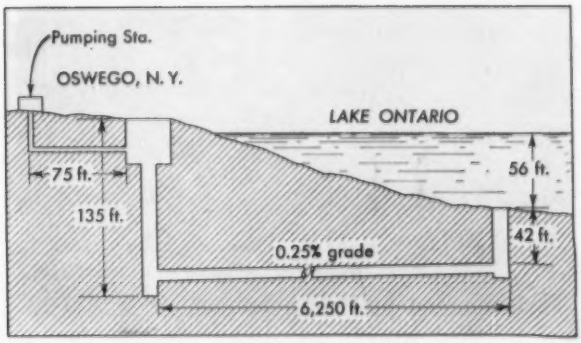
# HYDROSEAL and CENTRISEAL
**SAND, SLURRY & DREDGE PUMPS**
MAXIMIX RUBBER PROTECTED

## It's not just a bit of metal you're buying... it's FEET OF HOLE!

Three Ingersoll-Rand JR-38B Jackdrills with 1¾" Carset Jackbits, drilling through hard sandstone in the 8' diameter Oswego Water Tunnel. Thirty holes were drilled for each round, and two rounds were drilled, blasted and mucked per shift.

# CARSET JACKBITS average 500 FEET

## in Hard Sandstone on the OSWEGO TUNNEL JOB




Simplified schematic diagram of the Oswego Water Tunnel project. Drilling started with the 135 ft. access shaft and water riser. The upper 33½ ft. is square, the remainder being circular, 12 ft. in diameter. The 6,250 ft. tunnel, 8 ft. in diameter, was driven on a 0.25% up grade, to a point more than a mile out under the lake, ending 42 ft. below the lake bottom under a 56 ft. depth of water. A riser was driven upwards to within a few feet of the lake bed and the rock plug blasted free after which a strainer and inlet structure were set in place over the riser, a sump below tunnel line catching the muck. A 75 ft. tunnel 30'-0" below ground level carries water from the riser to the pumping station. Roof bolts were set in the main tunnel as a safety measure.

EXTENDING more than a mile out under the waters of Lake Ontario, the Oswego Water Tunnel brings an abundance of offshore fresh water to the city of Oswego, N. Y.

Driven by Herbert F. Darling, General Contractor, Williamsville, N. Y., this 6,250 ft. long tunnel, 8 ft. diameter, was drilled with Ingersoll-Rand JR-38B Jackdrills and 1⅞" Carset Jackbits. By sharpening the bits with machine precision on an I-R Jackbit Grinder and maintaining correct cutting angles bit footages were boosted from 300 to 500 feet. Rock was hard gray sandstone.

On-the-job performance like this — comparing *feet of hole per dollar of bit cost* — is the only true test of rock bit economy. Measure Carset Jackbits by this yardstick on any job, in any kind of rock. Compare them with any other bit you've ever used. The results will speak for themselves.

**Ingersoll-Rand**

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91st YEAR OF PUBLICATION

**SEPTEMBER 1957**

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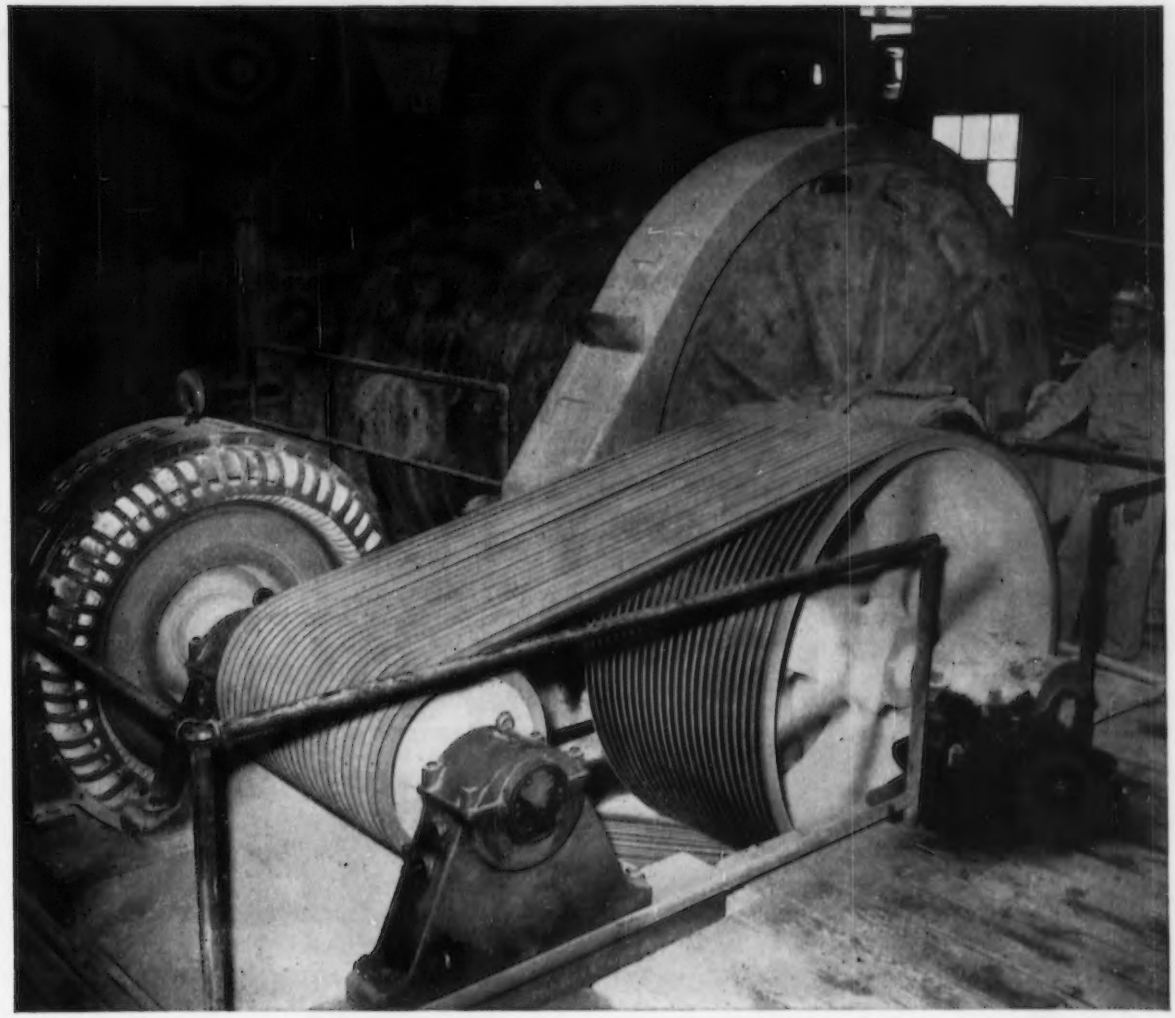
# B.F.Goodrich report:



# Big steel gizzard grinds rocks

### *B. F. Goodrich improvements in rubber brought extra savings*

***Problem:*** As long as that big steel drum (at left) keeps turning, it does a beautiful job of grinding copper ore into powder. Hundreds of steel balls do the grinding, just as pebbles in a chicken's gizzard pulverize food.

But getting that heavy mill to turning from a dead stop, sometimes snapped one or more V belts like pieces of string. Even after starting, the strain of keeping it going wore out belts before their time.

***What was done:*** When a B.F.Goodrich distributor heard of the problem, he recommended Grommet belts, a different kind of V belt developed and made only by B.F.Goodrich. On the outside a Grommet belt looks like any other V belt. But buried inside are two cord loops, made like twisted cables except that they're endless—no splices or overlaps. It's these two grommets that make the B.F.Goodrich belt strong enough to pull heavy loads and take sudden jerks without going to pieces.

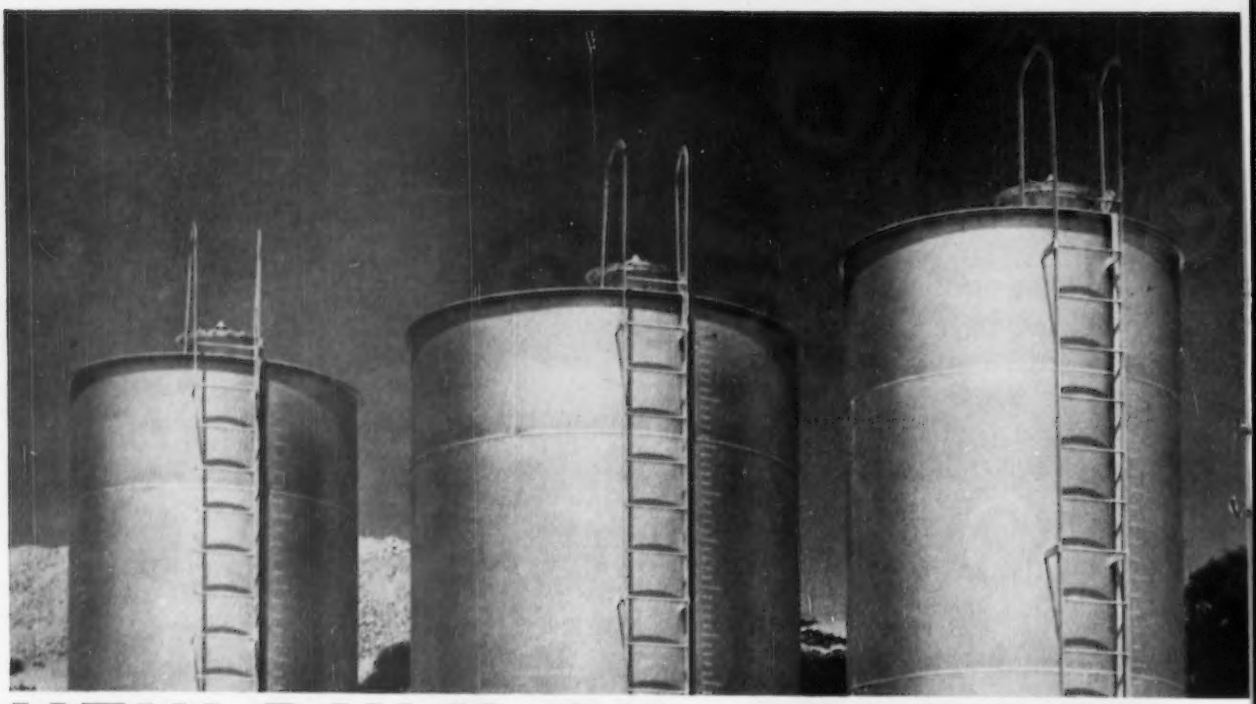
***Savings:*** The set of B.F. Goodrich belts shown above have been on the job nearly 6 years now—longer than any V belts used before—and they show no signs of wearing out. They've never needed to be adjusted, haven't lost a minute of the copper company's time.

***Where to buy:*** Your B.F.Goodrich distributor has full information on the B.F.Goodrich belts described here. And, as a factory-trained specialist in rubber products, he *can* answer your questions about *all* the rubber products B.F.Goodrich makes for industry. *B.F.Goodrich Industrial Products Co., Dept. M-136, Akron 18, Ohio.*

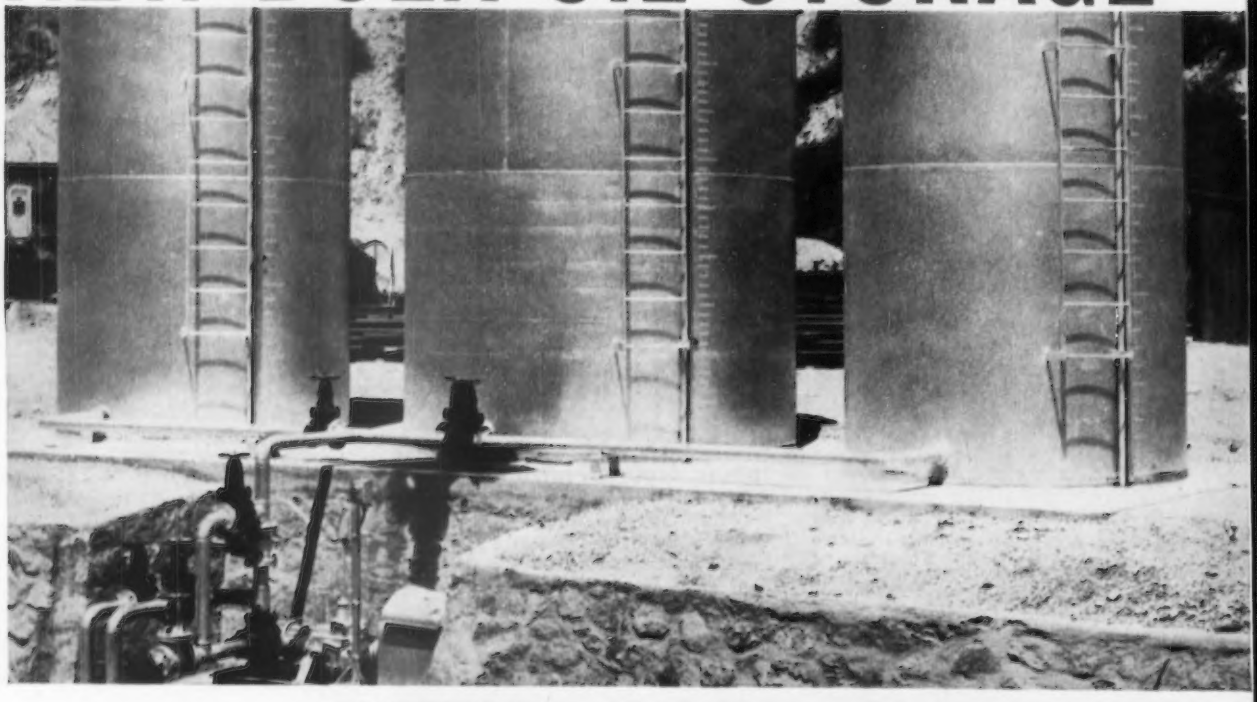
Grommet—T. M. The B. F. Goodrich Co.

**B.F.Goodrich**

**INDUSTRIAL PRODUCTS**

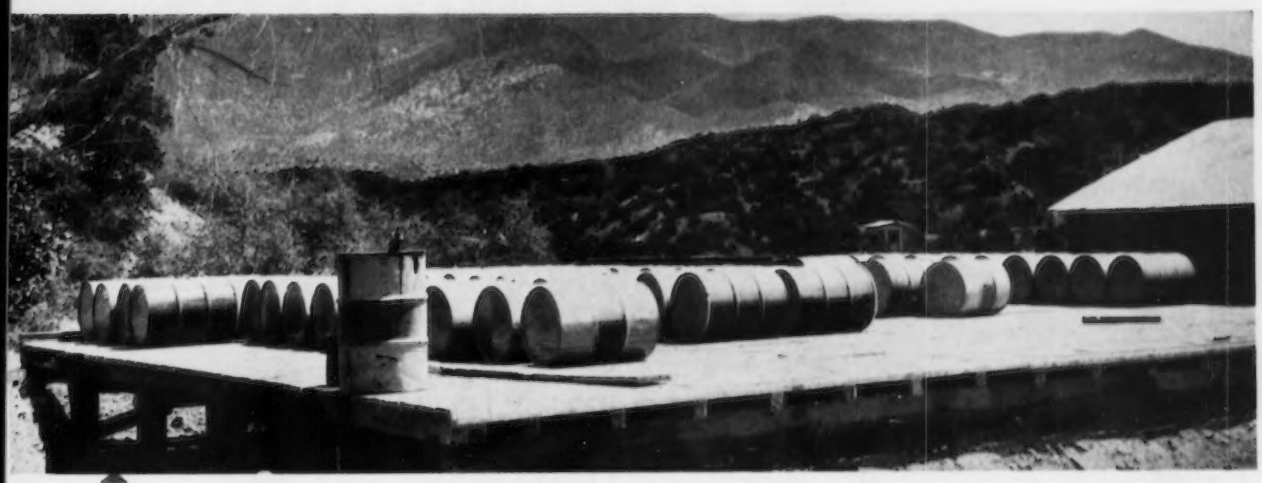


# NEW BULK OIL STORAGE



TEXACO

**NEW SET-UP** at Inspiration Consolidated Copper Co. utilizes one 10,000- gallon tank and three 6,000-gallon tanks for storing Texaco lubricants. The large tank and two of the smaller tanks are grouped in one location and piped so that one pump can unload a tank car into any of the tanks and feed from any of the three tanks to the disbursing equipment. This new system is cleaner, more efficient and economical.



**OLD SET-UP** involved handling 1,000 barrels per year—a considerable cost. Furthermore, most barrels were not drained completely, resulting in a substantial oil loss. The barrels shown here contain lubricants which Inspiration uses in small quantities.

# AND HANDLING SYSTEM

## pays off for Inspiration Consolidated Copper Co.

Inspiration Consolidated Copper Co. of Inspiration, Arizona, has expanded its operations many times since becoming a Texaco customer about twenty years ago. Its extensive open pit mining today calls for a sizeable fleet of trucks and other diesel-powered equipment—using approximately 1,000 barrels of oil per year.

Up until a year ago, Inspiration bought its Texaco lubricants in car-loads of barrels—and had the attendant problems and expense of handling and storing. Then, because of the company's expanded operations, a change was made to bulk storage and handling which offered much greater convenience and economy.

In the new, simplified system, lubricants are shipped by tank car and pumped directly into one 10,000-gallon tank and three 6,000-gallon tanks. This benefits Inspiration in four important areas:

1. **It cuts handling time and costs.**
2. **It makes inventory control much easier.**
3. **It's cleaner, more efficient—there's less waste.**
4. **The company is less dependent on shipping schedules.**

Perhaps a Texaco Lubrication Engineer can help you set up a storage and handling system that will prove efficient and economical for you. Call the nearest of more than 2,000 Texaco Distributing Plants in the 48 States or write:

The Texas Company, 135 East 42nd Street, New York 17, N.Y.

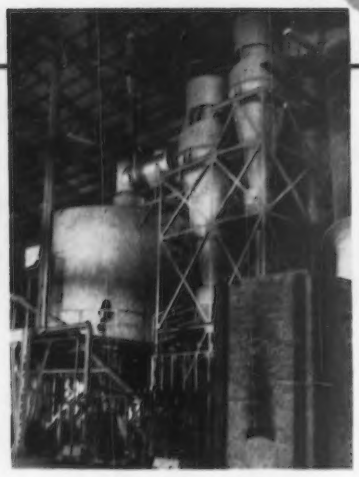
FOR OVER 20 YEARS, MORE COPPER ORE IN THE U.S. HAS BEEN MINED WITH TEXACO-LUBRICATED EQUIPMENT THAN WITH ANY OTHER

**Lubricants and Fuels**
**FOR THE MINING INDUSTRY**

Fe

# "Everything

$H_2SO_4$ Cu From a



One of two 20 ft. dia. FluoSolids Reactors roasting 235 metric tons per day of crushed pyrrhotite ore at Dowa's Okayama Plant.

## Fluidization—

## key to maximum utilization in Japan

Processing copper bearing pyrrhotite ore, the Dowa Mining Company at the Okayama, Japan plant is producing . . . and all from the same raw material . . . sintered iron ore for blast furnace use, cement copper and sulphuric acid.

Of major importance in this unique installation is the Dorrco FluoSolids System, consisting of two 20 ft. dia. Reactors plus auxiliary equipment. Utilizing the proven principles of fluidization, the crushed raw ore is roasted under controlled conditions in the System providing $SO_2$ gas for contact acid manufacture. Roaster calcine is acid leached for copper recovery and leach residue is sintered as blast furnace feed.

The Dorr-Oliver research, design and engineering staffs and our Associates in Japan, Sanki Engineering Co. Ltd., of Tokyo, have collaborated with Dowa Engineers before. At Dowa's hydro-metallurgical plant in Kosaka, Japan, the Dorrco FluoSolids System is a prime factor in the world's first successful roasting of copper and zinc with electro winning of both metals. In the Okayama installation as at Kosaka, manufacture of the FluoSolids Reactors and a number of components in Japan with auxiliary equipment furnished from the U. S. proved to be most advantageous to Dowa.

This is but another example of how the flexibility of the Dorr-Oliver Worldwide engineering organization can work to the advantage of a client. It can work for you . . . For detailed information on D-O equipment and services involving the separation of finely divided solids in suspension or fluid techniques, drop a line to Dorr-Oliver Inc., Stamford, Connecticut.

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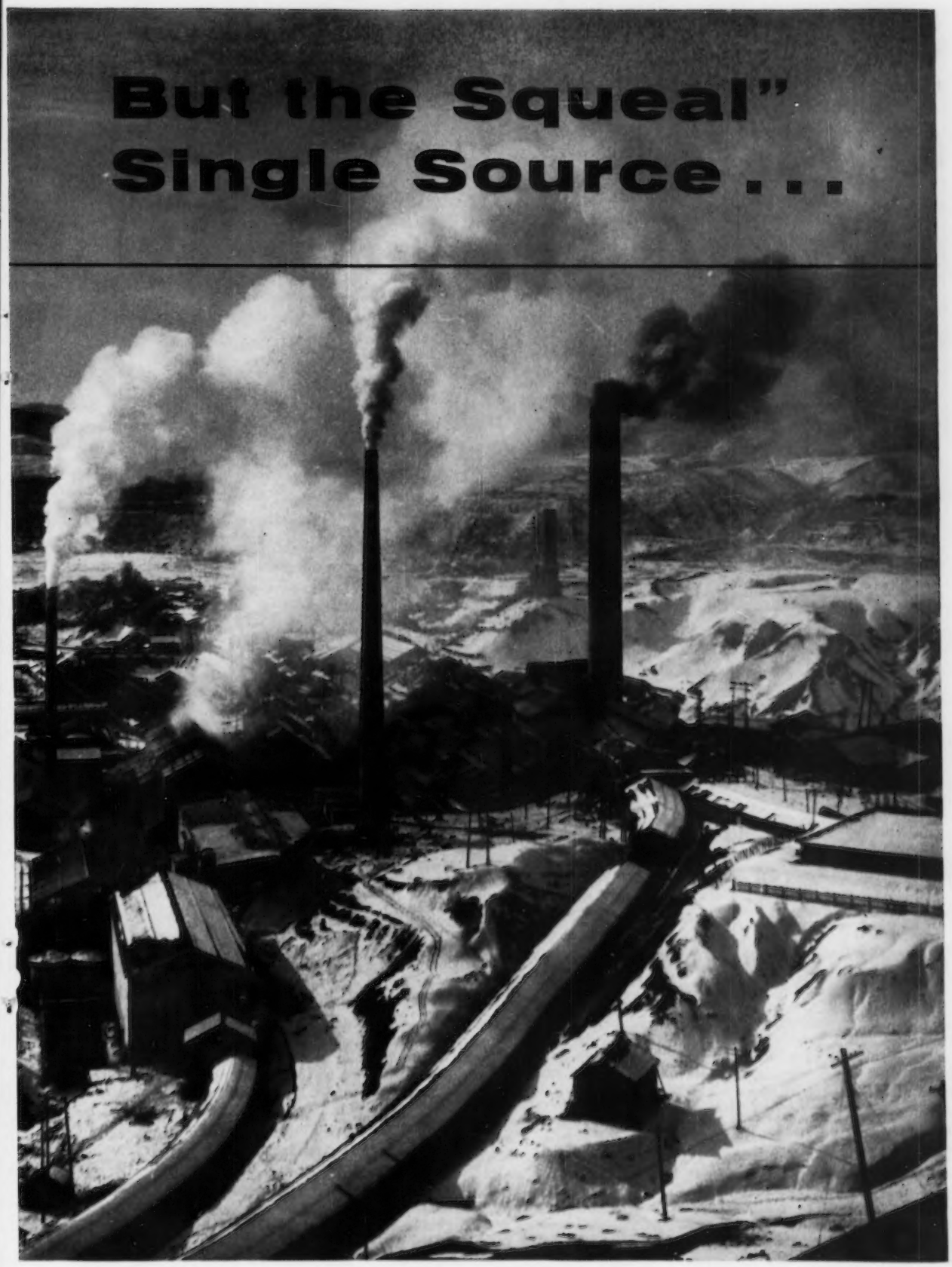
Dowa Mining's Kosaka hydro-metallurgical plant where Dorrco FluoSolids System roasts 83 metric tons of complex copper-zinc concentrates per day.


But the Squeal"
Single Source . . .

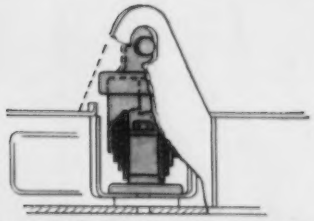
# Tough hauling problem? Take a look at

If heavy loads, rough roads and steep grades, *with little or no turn-space,* are part of your hauling problems, then you'll find some answers in Koehring Dumptor. Come along on a typical load-haul-and-dump cycle:

There's no slow jockeying back and forth at the loader. Dumptor spots into position fast — is loaded over the sides, or over either end. Wide-flared 6-yard body, with low height, provides a big square target — *64 square feet, to be exact.* This reduces spillage, steps up output of shovel, dragline, clamshell, or tractor type loader — adds extra trips to daily production.

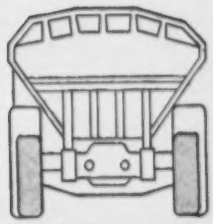
On the haul, Dumptor accelerates fast, pulls through soft ground with less shifting — climbs 24% ramps or grades fully loaded. It has better than 6 H.P. of *"go"* for every ton of loaded weight. Narrow haul roads, ledges, tunnels, overhead ramps and trestles are no problem, *There is no need to turn,* because Dumptor operates with equal ease and speed in either direction. It gets this unique *no-turn shuttle-haul* advantage through a constant-mesh transmission that gives the same, fast, 3-speed travel forward and backward. Every turn saved cuts 15 seconds off cycle-time.

At the dump area (above), *gravity* tilts the body, dumps the load in *one second.* No 15 to 25-second wait for slow-acting mechanical body-hoist — no hoist maintenance. *Gravity-dump* never balks — never wears out. Heavy-duty Dumptor



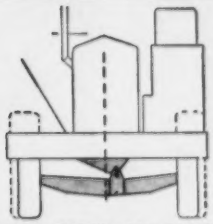
## HEAVY-DUTY CHASSIS SPRING

**Dumptor has just one chassis spring — a heavy snubber-type, mounted between main frame and steering axle. No leaf springs. Big shock-absorbing drive tires eliminate springs and spring maintenance on drive axle.**



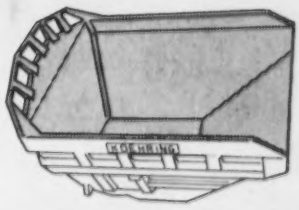
## TIRES TRACK IN DIRECT LINE

**Wide, heavy steering axle puts Dumptor steer wheels in line with drive wheels. Tires track in the same path. There's less rolling resistance, better traction in soft ground, on loose stockpiles and over rough haul roads.**



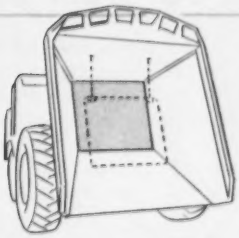
## OFF-SET PIVOT ON AXLE

**Pivot point on steering axle is offset from center line 3¼" toward operator side of Dumptor. There's no sag, even with unbalanced loads. Steering axle oscillates up to 21", helps keep twisting strains out of main frame.**



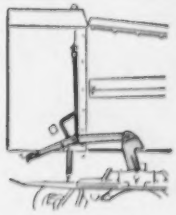

## STREAMLINED ALL-STEEL BODY

**There are no bulges or ledges inside the body. Top edge is box beam construction. Sides and ends are ribbed with 5 and 8-inch channels. Bottom is lined with multiple steel beams. Sturdy ridge bar joins rock guard teeth.**



## BOLTED OR FREE-SWINGING PAN

**Heavy steel kick-out pan is ½" thick. Pan can be bolted to body floor for extra protection when loading rock. Remove bolts, and pan has swinging kick-out action . . . breaks load suction when dumping wet or sticky materials.**



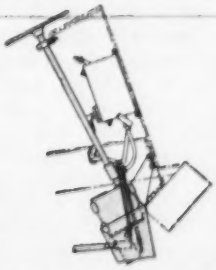
## SIMPLE BODY LATCH

**Body latch for 1-second gravity dump is simple and trouble-free. Latch is engaged by a single hook mounted on the chassis frame. Dump lever is located inside cab in an easy-to-reach position for quick effortless dumping.**

# Dumptor® . . . .

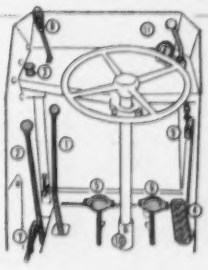
also has a ton of strength for every ton of payload capacity. Sides, ends of body are rib-reinforced. Double-plate bottom is lined with multiple steel beams. Check its other advantages at right — then ask Koehring distributor to demonstrate what Dumptor can do on your heavy, off-road hauling. Call him *today*.

**KOEHRING**
DIVISION OF KOEHRING COMPANY
MILWAUKEE 16, WISCONSIN K766



## HYDRAULIC POWER-STEER

**Power steering adds to Dumptor maneuverability for fast spotting, lets driver handle off-road travel with ease. Dumptor has a short turning radius of only 19'-3", far less than other haulers of comparable capacity.**



## EASY-REACH CONTROLS:

**(1) speed gear shift, (2) directional gear shift, (3) starting aid, (4) foot throttle, (5) clutch pedal, (6) brake pedal, (7) parking brake, (8) body release lever, (9) hand throttle, (10) light control switch, (11) Controlator.**

EIMCO 40-H CONVEYOR LOADER

EIMCO 630 TRACTOR-LOADER

EIMCO 21 LOADER

EIMCO 12B LOADER

Crawler or Rail Mounted . . .

## There s An Eimco Mucking Machine For Your Drift and Mining System

**An Eimco 630 Tractor-Loader** mucked inside an 18' circular shaft in Wyoming and a large rectangular shaft in West Virginia. On basis of its performance, it was publicized as follows: "This machine maneuvers well in confined space and readily loads into shaft buckets. It seems to offer many advantages in shaft mucking, loads faster than a clamshell and is safer to operate".

**In Eastern U. S., an Eimco 21** rail-mounted loader was instrumental in the early completion of a 6250' x 8' diameter tube that will bring fresh offshore water from a lake to city mains. It worked around the clock, tossing 30 yard rounds of rock (brought down 6 times every working day) over its back into 1 yard end-dump cars.

**Operating in rock development** work for a large German mining firm, 5 Eimco 40-H rail-mounted conveyor loaders have driven 12½ miles with a combined downtime equivalent to less than two working days.

**In England, rail-mounted** 12 B's - Eimco's smallest mechanical loader — muck slate in a small diameter heading. The discovery: "Loading with Eimco 12 B's has many advantages over chute and grizzly system. It's faster, safer and more economical".

**In mining and tunneling operations throughout the world, Eimco mucking machines continue to establish new production records under tough, grueling service.**

There are many profitable reasons for specifying Eimcos when you buy your next mucking machines. And there's an Eimco type and size of mucker to meet your drift and mining system needs. Write today for full information.

**THE EIMCO CORPORATION**

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B-280

"LARGEST FILL IN OHIO" is how C. F. REPLOGLE Construction Co., Circleville, Ohio, describes the 97-footer on its U.S. Route 40 relocation job. Other cuts and fills run between 80 and 90 feet – and up to 70% of the material is broken limestone and sandstone. This is tough on tires—but Goodyear Triple-Tough 3-T Nylon Cord TUBELESS tires take it even better than tube-type, cut earth-mover tire down time to new LOWS. Tubeless tires shown at work are (left to right) new wide-base Sure-Grip Lug, wide-base Hard Rock Lug and standard All-Weather.

# Up to 80% cut in earth-mover tire down time—

## *plus many other advantages!*

Goodyear TUBELESS tires end tube and flap troubles—causes of as much as 80% of earth-mover tire down time. They also end costs of tube replacement and many-item inventories.

You save man-hours, too—for mounting is simple and emergency repairs may often be made *without removing tires at all!*

AND you save tires—for with Goodyear TUBELESS, small injuries usually show *before* they get serious.

Be sure *you* specify *Goodyear* TUBELESS tires on all new equipment—and see the *Goodyear* dealer for change-over of present vehicles. Goodyear, Truck Tire Dept., Akron 16, Ohio.

ON-JOB SERVICE BOON TO CONTRACTORS. Priceless time and valuable tires are saved by this fast and expert service. Strategically located Goodyear shops and field crews are convenient to jobs almost anywhere.

*Buy and Specify* **GOODYEAR**

**MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND**

All-Weather, Road Lug, Sure-Grip—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

*Look for this nearby Goodyear dealer sign for better tire values —better tire care.*

**Now Tubeless or Tube-Type with Triple-Tough 3-T Nylon Cord**

ALL-WEATHER EARTHMOVER

HARD ROCK LUG

HARD ROCK RIB

SURE-GRIP LUG

ROAD LUG

# ON THE go

by J. Hall Carpenter

**THE SEPARATION OF SUPERFINES** by standard high tension separators has now been successfully accomplished on a number of ores. Where we formerly felt that —200 mesh material was too fine to handle, techniques developed recently have given excellent separations on 400 mesh material and copper oxides have been successfully treated as fine as 800 mesh.

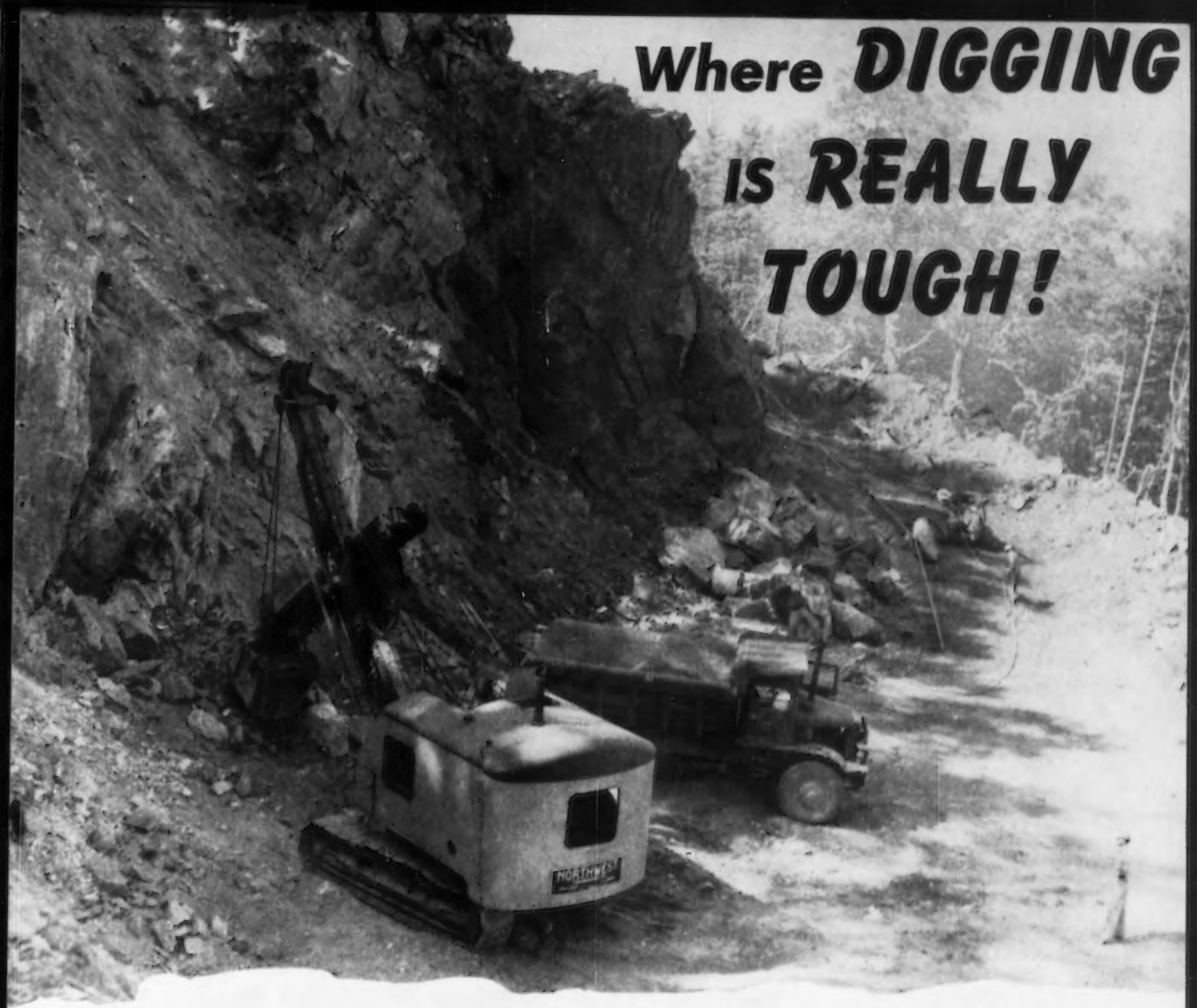
**A COMPLETE REDESIGN HAS BEEN COMPLETED** on the series HS High Tension Separators. This series of separators, used widely for the production of cassiterite, columbite, monazite and scheelite, incorporates many new features. In line with Carpco's policy to keep well advanced technically, our development department has incorporated such features as the use of silicon rectifiers for finger tip or automatic rotor speed control, a new "low loss" high voltage system and many others. Bulletins on the new machines are available on request.

**THE U. S. BUREAU OF MINES** has recently purchased a Carpco Jet Drill for their new exploration program for South Eastern United States. Jet type drilling has become universal practice for sampling sand-like minerals. Carpco now not only manufactures the jet drills, but is offering rental and custom drilling services along with regular laboratory service for ore body evaluations.

**ROTARY DRYERS AVAILABLE FROM AUSTRALIA** is good news for many plants. The Carpco Dual Flow Rotary Dryers, developed for drying and heating minerals with no loss of fines, are now being manufactured in the Brisbane plant. These small dryers are highly efficient and compact. Developed particularly for tin concentrates, columbite and scheelite, they also make ideal pilot plant units. Bulletin RDB-101 is available on request.

Carpco

CARPCO RESEARCH AND ENGINEERING • CARPCO MANUFACTURING, INC.
CARPCO CONSTRUCTION CORPORATION • CARPCO EXPORT CORPORATION
JACKSONVILLE, FLORIDA, U. S. A.



# Where DIGGING IS REALLY TOUGH!

This big Model 6 Northwest is in as tough digging as you'll ever find. This is Kyanite, an aluminum silicate used in ceramics to offset the shrinking of clays.

Kyanite is HARD—often reaching a hardness of 7.

The mine is that of Kyanite Mining Corp. of Cullen, Virginia, and this is one of four Northwests that they use on their operations. This is the third repeat order which is incontrovertible proof of how Northwests perform in this hard digging.

Northwests have the stamina for mining operations like this. The Northwest Dual Independent Crowd utilizes force most other independent crowds waste, giving that extra push for hard rock work. The "Feather-Touch" Clutch Control makes operation easy without pumps, compressors, valves, or tubing. The Cushion Clutch eliminates overloads before they can damage operating machinery. Cast steel bases and machinery side frames take the shocks of rock digging. Uniform Pressure Swing Clutches eliminate the jerks and grabs that make spotting heavy loads difficult. These and many other Northwest advantages combine to make the Northwest a *real* Rock Shovel.

If you have a pit problem or are modernizing, get complete details on Northwest equipment. Ask to see a Northwest Man.

**NORTHWEST ENGINEERING COMPANY**
**1509 Field Bldg., 135 South LaSalle Street, Chicago 3, Illinois**

THE GREATEST COMBINATION OF PROVED ADVANTAGES EVER BUILT INTO A SHOVEL, CRANE, DRAGLINE OR PULLSHOVEL

# NORTHWEST

*Convertible for any Mining Material Handling or Excavation Problem*

56-11-5G

At Steep Rock Lake, Ontario, dredge pumps lined with Lukens "T-1" steel (321 min. Brinell) remove two million cu. yds. per month.

# Rock, Gravel Crash Through World's Most Powerful Dredges; Lukens "T-1" Steel Adds 33% to Liner Life!

TRADEMARK

Dewatering of this Canadian lake by Caland Ore Company, Ltd., will permit open-pit mining of hematite ore.

In dredging operations, impact and abrasion combine with brutal force to give pump liners expensive beatings. In the world's most powerful dredges, Lukens "T-1" steel now slashes this expense for Construction Aggregates Corp., agents for Caland Ore Co., Ltd.

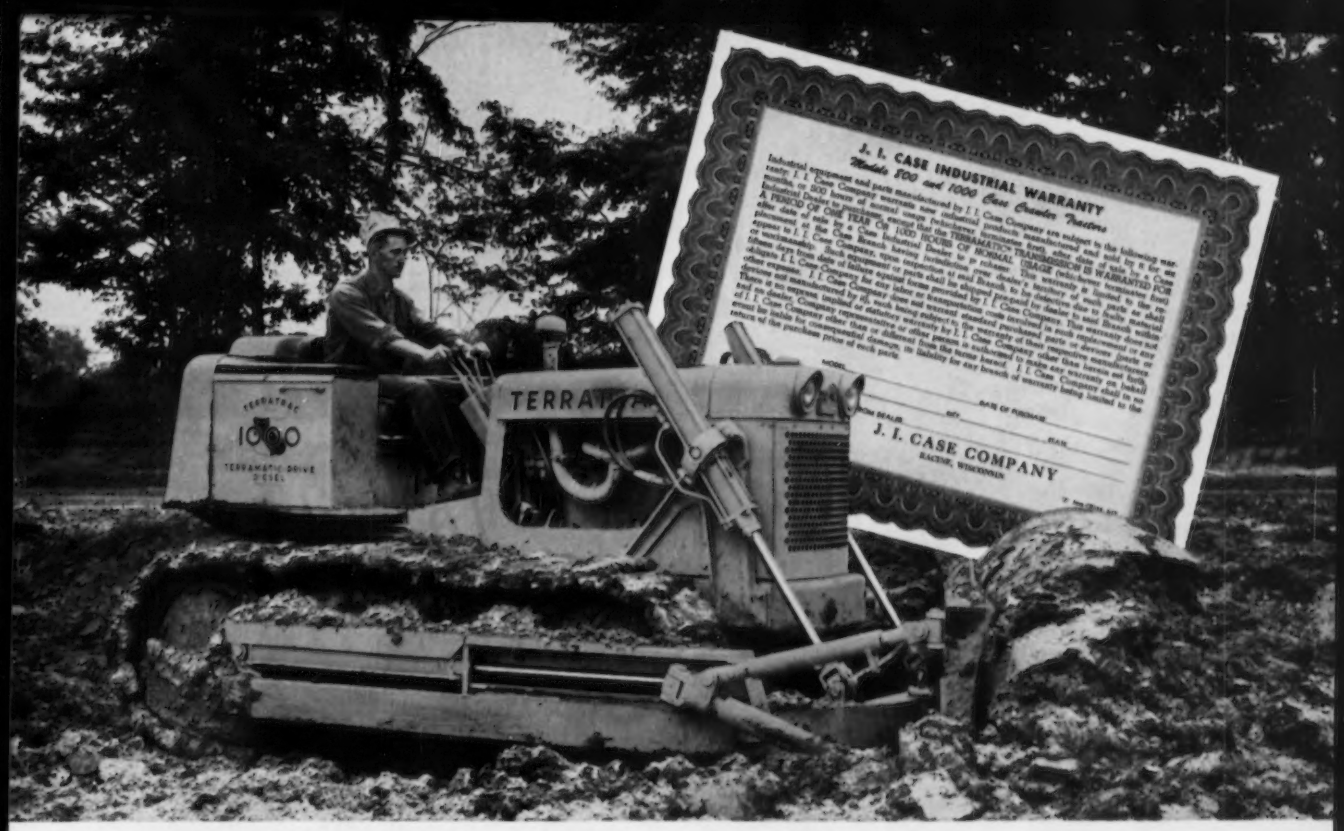
*With order after order, Lukens "T-1" steel is lasting 33% longer than the abrasion resistant steel formerly used.*

Whether you handle stone, coal, or metal ores, Lukens "T-1" steel used in the areas hardest hit by punishing abrasive impact will save you money, too. It has tripled the life of rock driers. The 321 minimum Brinell quality has been known to outlast previous metals by 18 to 1 in quarry wear plates. Chutes, hoppers, and mine cars are other typical applications.

And Lukens "T-1" steel retains its remarkable combination of hardness and toughness at temperatures well below zero. Send for our informative, illustrated booklet, "Lukens 'T-1' Steel." Write Manager, Marketing Service, Room 958, Lukens Steel Company, Coatesville, Pennsylvania.

LUKENS ®

## Helping industry choose steels that fit the job




# *Announcing new*

# ONE-YEAR WARRANTY

## on the sensational Terramatic transmission

Here is really *terrific news* for tractor-users everywhere! Because of the outstanding performance of the new higher-speed 80 and 100 HP Case® TerraTrac® crawler tractors, Case has DOUBLED the warranty on its counter-rotating Terramatic transmission — *from 6 months to a full year* — on all new machines shipped after July 15, 1957. This means that you can now purchase a torque-converter-equipped Model 800 or 1000 Case TerraTrac crawler with the assurance that you are getting the *finest transmission and the most liberal service warranty in the tractor industry today.*

Biggest advantage of the counter-rotating Terramatic transmission is that it gives you *much faster working speeds and greater ease of maneuverability* than you ever dreamed possible with a crawler tractor. Simplified hydraulic controls let you shift on-the-go . . . turn "on a dime" . . . as smoothly and easily as driving the most modern passenger car. Result: *Operators can do twice as much work, with about one-tenth the effort.*

Best of all, these highly-maneuverable Model 800 and 1000 Case TerraTrac crawlers are available with a full range of advance-design equipment — including high-dump tractor-shovels *up to 2-cu. yd. capacity,* plus heavy-duty dozer blades that tilt or angle *hydraulically* — right from the operator's seat. Get the complete story today direct from your nearest Case Industrial Dealer.

CASE

1st in quality
for over 100 years

*Clip . . . mail for free catalog*

**J. I. CASE CO.,** Dept. J1377, Racine, Wis., U.S.A

☐ Send catalog on Model 800 and 1000 crawler tractors
I am most interested in ☐ Bulldozers ☐ Angledozers ☐ Loaders

Name ..... Title .....
Company .....
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City ..... State .....

CT-D-75

**Industrial Wheel and Crawler Tractors • Loaders • Dozers • Backhoes • Engines**

Recovering uranium from solution with an ion-exchange column.

**SWECO's Ore Investigation Laboratory has studied 4,000 ore samples to determine feasibility of milling on a commercial basis.**

# *To Mill... Or Not To Mill?*

"Should I build a mill to treat my ore commercially? How can I find out – without going to the expense of full-scale production?"

### Laboratory-scale investigation

SWECO's Ore Investigation Laboratory has successfully answered these questions 4,000 times over – for operating companies in the mineral processing field, for investment groups and financial institutions.

Again and again, thorough laboratory investigation has minimized or completely avoided expensive testing on a plant scale. And the scores of mills designed on the basis of SWECO Laboratory findings are profitably proving that laboratory results can be duplicated in commercial operation.

### Supplemental or complete service

Available on a custom basis at the SWECO Laboratory is an expert team of metallurgists and ore investigation technicians, pooling years of field, laboratory and design experience. Here is a complete facility for every phase of ore investigation: visual inspection, sample preparation, analysis, study of the most up-to-date ore concentration methods. SWECO's Engineering and Construction Division is staffed and equipped to undertake all or any part of your ore beneficiation program, from laboratory investigation through flow sheet development, feasibility report, to design and construction of the mill itself.

SWECO has a world-wide reputation for dependability and service . . . in *engineering and construction* . . . . in the *design and manufacture of specialized process equipment* . . . in a complete line of superior *vibrating screen separators.*

For complete information on SWECO ore investigation services, write for bulletin E-6-12.

SWECO

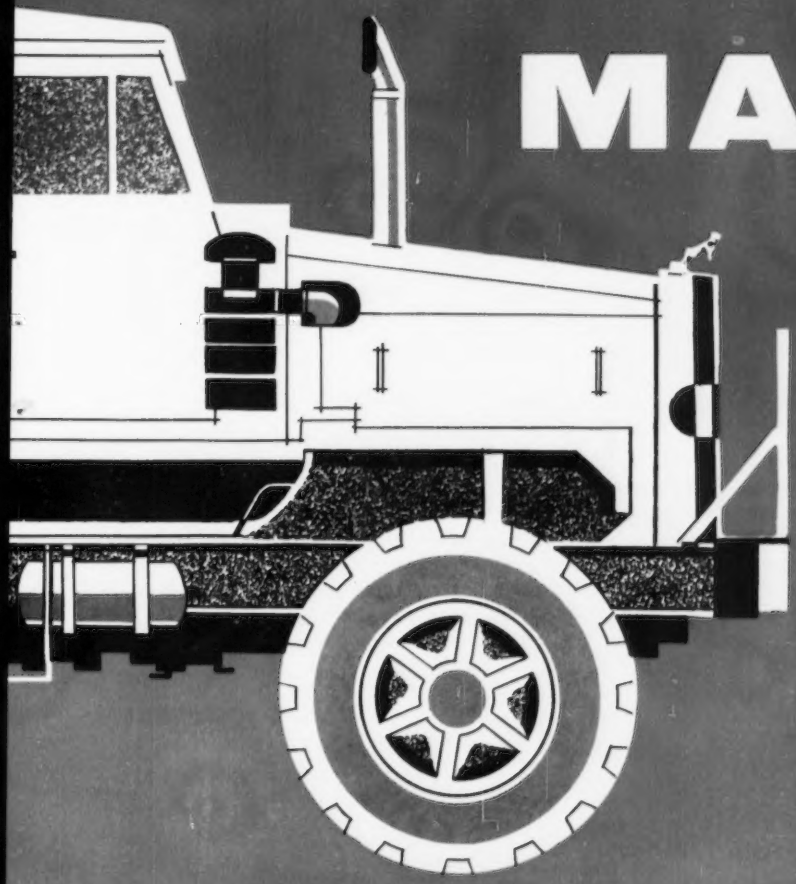
Southwestern Engineering Company

*Engineers and Constructors . . . Manufacturers*

4800 Santa Fe Avenue • Los Angeles 58, California

**MACK LRX**

# NEW MACK



## heavy-duty four- and six-wheel dumpers

### 15- to 34-ton capacity

### ✻ LARGEST SELECTION OF HEAVY DUMPERS

Mack offers you the most complete line of dumpers for mining, quarrying, road building, construction. From heavy-duty 170 horsepower, four-wheel dumpers with 15-ton capacities to super-duty 400-horsepower, six-wheel dumpers with 34-ton capacities, Mack provides the economy and performance that can mean bigger hauling profits for you.

### ✻ CHOICE OF ENGINES

Mack offers you a choice of engines . . . Cummins diesels in the 300- and 400-horsepower class . . . or Mack Thermodyne and Cummins diesels in the 170 to 205 horsepower class. No need to alter existing maintenance facilities to handle new engine makes . . . you get the truck you want with the engine you want.

### ✻ OUTSTANDING PERFORMANCE

When you buy Macks, you know that you are getting top performance, outstanding economy, maximum dependability—qualities that have made Mack the acknowledged heavy-duty truck leader in the industry. Moreover, Mack dumpers are planned for accessibility throughout . . . engines are easily reached, no place in the suspension ever needs adjustment—these and many more Mack features reduce maintenance costs and make routine servicing easier. And in Macks, you get the finest transmissions and axles available . . . made by Mack and found only in Macks!

### ✻ COMPETITIVELY PRICED

Mack off-highway dumpers are priced right in line with competitive makes. Yet, with Macks, you get those "extras" that mean more payloads at lower hauling costs . . . cabs engineered for maximum driver efficiency . . . specially designed components with extensive use of heat-treated alloy steels . . . single-unit all-welded frames that can take plenty of hard knocks . . . outstanding performance and economy from a complete line of engines.

### ✻ STOCK DELIVERY

All 15 and 22½-ton Mack dumpers are available from stock. The units you want with the engines and transmissions you want can be supplied upon gratifyingly short notice. There are no delays, no production schedules for you to worry about. For more information on delivery, contact your local Mack Dealer or Representative.

# MACK LRX

**capacity: 15 tons**

This four-wheel, off-highway dumper combines a big 15-ton rated capacity with outstanding maneuverability. Either a Mack or Cummins Diesel engine —along with heavy-duty clutch, 10-speed transmission, and Mack's Planidrive rear axle assembly —gives plenty of pulling power for long hauls on steep grades. Rugged, unified frame assembly, powerful air brakes, and comfortable cab with driver's position offset to the left assure the top performance and efficiency that have made the LRX a highly popular dumper in mine, quarry, and road-building operations.

## CONDENSED SPECIFICATIONS

### STANDARD EQUIPMENT

| DIMENSIONS: | 14.00-24 Rear Tire |
|---|---|
| Wheel Base | 13' 4" |
| Platform | 9' 1" |
| Overall Width | 9' 11" |
| Overall Height | 10' 8" |
| Overall Height (Body Raised) | 18' 8" |
| Overall Length | 24' 7½" |
| Turning Circle Diam. (To outside edge of tire) | 60' |
| Weight (Chassis, Body & Hoist) | 33,000 lbs. |
| Payload | 30,000 lbs. |

**ENGINE (Diesel):**

| | |
|---|---|
| Model | END 673 |
| Make | Mack, Thermodyne |
| Type | Naturally aspirated |
| Number of cylinders | Six |
| Bore and stroke | 4⅛" x 6" |
| Piston displacement, cu. in. | 672 |
| Brake horsepower (@ 2100 r.p.m. (gov.) | 170 |
| Max. torque (@ 1200 r.p.m. | 480 lb.-ft. |

**CLUTCH (Available with END 673 only):**

| | |
|---|---|
| Type | Mack single-plate, dry |
| Area of engagement, sq. in. | 253 |

**ELECTRICAL SYSTEM:**

Voltage and capacity — 12 V., 50 Amp. (24 V., Starting)

**TRANSMISSION:**

| | |
|---|---|
| Type | Mack selective, constant mesh |
| No. of speeds, forward | Ten |
| reverse | Two |

**FRONT AXLE:**

Make — Mack Reversed-Elliott, drop forged I-beam

**REAR AXLE:**

| | |
|---|---|
| Make | Mack Planidrive |
| Drive | Dual Reduction |
| Final Drive (3rd reduction) | Planetary gear train within wheel hubs |
| Total Ratio | 16.5 |

**BRAKES (Air):**

| | |
|---|---|
| Compressor | Tu-Flo |
| Type | Internal expanding |
| Front, size | 17¼" x 5" x ¾" |
| Rear, size | 20" x 7" x ¾" |
| Hand, size | 12" x 5" x ⅜", Bendix |

**FRAME:**

| | |
|---|---|
| Side-members, size | 12½" x 6¼" x ½", wide flange I-beam, rolled section |
| Section modulus | 60.7 (per rail) |

**SPRINGS:**

| | |
|---|---|
| Front, type | Semi-elliptic |
| Rear, suspension | Semi-rigid, axle mounted to frame |

**WHEELS:**

Type — Cast, spoke

**STEERING GEAR:**

Control — Manual

| TIRES: | Front | Rear |
|---|---|---|
| Size | 12.00-24 (16P) Rib | 14.00-24 (20P) Lug |

**CAB:**

**Type:** Heavy-duty off-highway, closed, all-steel welded. Offset 10¼" to left of chassis centerline provides clear vision for driver to rear.

**CHASSIS EQUIPMENT:** Front and rear tow pins; air horn on cab roof; cab entrance steps and platforms; rear view mirror, left side; channel type front bumper; dual windshield wipers; vertical exhaust; stop-tail light; rim lug wrench and handle.

**HOIST:**

Make & model — Heil

Type - Twin, double-acting, 8" diameter, hydraulic cylinders with 24" stroke, 70° dumping angle.

**BODY:**

| | |
|---|---|
| Type | Rock, with scoop end |
| Make | Heil |
| Capacity, line of plate | 9.8 cu. yds. struck |

**Construction:** ¼" steel plate shell bottom; ⅜" sides and header; ½" wear and side bevel plates; ¼" canopy. 3" x 5 lb. channels between floor plates either side of a 1⅝" edge-grain hardwood middle section filler.

### OPTIONAL EQUIPMENT

**ENGINE (Diesel):**

| | | |
|---|---|---|
| Model | NHB | ENDT 673 |
| Make | Cummins | Mack, Thermodyne |
| Type | Naturally aspirated | Turbocharged |
| Number of cylinders | Six | Six |
| Bore and stroke | 5⅛" x 6" | 4⅛" x 6" |
| Piston displacement cu. in. | 743 | 672 |
| Brake horsepower (@ 2100 r.p.m. (gov.) | 200 | 205 |
| Max. torque (@ r.p.m. | 1200 | 1400-1600 |
| pound-feet | 537 | 560 |

**CLUTCH (Included with NHB and ENDT 673):**

| | |
|---|---|
| Type | Mack two-plate, dry |
| Area of engagement, sq. in. | 416 |

| TIRES: | Front | Rear |
|---|---|---|
| Size | 13.00-24 (18P) Rib | 16.00-25 (20P) Lug |

**BODY:**

| | |
|---|---|
| Type | Flared Quarry |
| Make | Heil |
| Capacity, line of plate | 11 cu. yds. struck |

**Construction:** ¼" steel plate shell bottom; ½" sides; ½" header, slope; ⅜" header, vertical; ½" wear plate; ¼" canopy. 3" x 5 lb. channels between floor plates either side of a 1⅝" edge-grain hardwood middle section filler.

**Body Equipment:** (for std. and opt. bodies) — (9) ¾" x 6" alloy wear bars; rock ejectors; ½" alloy wear plate; horizontal bolsters (3 per side); canopy, loose for export shipment. (for std. body only): exhaust heating connections; welded-on side boards.

**CHASSIS EQUIPMENT:** Automatic radiator shutters; Wagner "BB" (24 hour chart 0-3500 r.p.m.) tachograph, in place of standard Tachometer; speedometer; hubodometer, left front wheel; Vickers power steering; front wheel limiting valve; hand control valve to operate rear service brakes; low air pressure indicator, Wig-Wag type; screen type radiator guard; 25,000 B.T.U. hot water cab heater with defrosters; spare rim; hydraulic jack, 20-ton; air starting; cold starting equipment; insulating dash mat.

**MACK — FIRST**

# MACK LVX
**capacity: 22½ tons**

This four-wheel dumper with its 22½-ton rated capacity provides maximum payloads at minimum unit cost. Equipped with either a 300 or 335-horsepower engine, over-gear transmission with two-speed compound or torque converter, and Mack's exclusive Planidrive rear axle assembly, it is powered to give top performance under the most punishing operating conditions. All-welded, single-unit, alloy-steel frame gives LVX's stamina and rugged durability. Elbow steering column, hydraulic steering booster, two-plate air-assisted clutch, and job-engineered cab with extreme left driver position assure maximum operating efficiency. From top to bottom, this big Mack gives you the "extras" that mean minimum hauling costs.

## CONDENSED SPECIFICATIONS

### STANDARD EQUIPMENT

**DIMENSIONS:**

| | |
|---|---|
| Wheelbase | 14' 2" |
| Platform | 9' 11" |
| Overall Width | 11' 2" |
| Overall Height | 11' 4⅛" |
| Overall Length | 26' 7½" |
| Overall Height (Body Raised) | 21' |
| Turning Circle Diam. (To outside edge of tire) | 62' |
| Weight (chassis, body & hoist) | 40,800 lbs. |
| Payload | 45,000 lbs. |

**ENGINE (Diesel):**

| | |
|---|---|
| Model | NHRBIS |
| Make | Cummins |
| Type | Supercharged |
| Number of cylinders | Six |
| Bore and stroke | 5¼" x 6" |
| Piston displacement, cu. in. | 743 |
| Brake horsepower @ 2100 r.p.m. (gov.) | 300 |
| Max. torque @ 1500 r.p.m. | 818 lb.-ft. |

**CLUTCH:**

| | |
|---|---|
| Type | Mack Two-plate, dry |
| Area of engagement, sq. in. | 416 |
| Actuation | Manual, with air assist |

**ELECTRICAL SYSTEM:**
Voltage and capacity . 12 V., 50 Amp. (24 V. Starting)

**TRANSMISSION:**

| | |
|---|---|
| Type | Mack selective, constant mesh |
| No. of speeds, forward | Eight |
| reverse | Two |

**FRONT AXLE:**
Type . . . Mack Reversed-Elliott, drop forged I-beam

**REAR AXLE:**

| | |
|---|---|
| Make | Mack Planidrive |
| Drive | Dua Reduction, spiral bevel |
| Final drive (3rd reduction) | Planetary gear train within wheel hubs |
| Total Ratio | 17.66 |

**BRAKES (Air):**

| | |
|---|---|
| Compressor | Tu-Flo |
| Type | Internal expanding |
| Front, size | 17¼" x 5" x ¼" |
| Rear, size | 18" x 10" x ¼" |
| Hand, size | 12" x 5" x ⅜" |

**FRAME:**

| | |
|---|---|
| Type | I-beam, wide flange |
| Material | Alloy steel |
| Side-members, size | 13⅜" x 8" x ½" (Fabricated) |
| Section modulus | 74.8 per rail |

**SPRINGS:**

| | |
|---|---|
| Front | |
| Type | Semi-elliptic |
| Suspension | Mack rubber shock insulators |
| Rear | |
| Type | Progressive rate, semi-elliptic |
| Suspension | Cam face slipper ends with radius rods |

**TIRES:**

| | Front | Rear |
|---|---|---|
| Size | 14.00-24 (16P) Rib | 18.00-25 (24P) Lug |

**WHEELS:**
Type . . . . . Cast, spoke

**STEERING GEAR:**
Power steering assist . . . Vickers hydraulic booster

**CAB:**
Type . Heavy-duty off-highway, closed, all-steel, welded. Cab offset 10¼" to left of chassis centerline provides clear vision for driver to rear.

**CHASSIS EQUIPMENT:** Screen type radiator guard; front and rear tow pins; air horn on cab roof; dual windshield wipers; two air reservoirs; rear view mirror, left side; Mack power take-off and control (not available with Allison Transmission); door in hood side for access to oil filler and dip stick; exhaust through hood with inline muffler; channel type front bumper; stop-tail light; rim lug wrench and handle.

**HOIST:**
Type . . . Twin, double-acting, outboard mounted, three section telescopic cylinder assembly directly connected to body and chassis through a universal joint arrangement providing a 70° dumping angle.

**BODY:**

| | |
|---|---|
| Type | Rock, with scoop end |
| Make | Heil |
| Capacity, line of plate | 14.8 cu. yds. struck |

**Construction:** ¼" steel plate shell bottom; ⅜" sides and header; ½" wear and side bevel plates; ¼" canopy. 3" x 7.1 lb. channels between floor plates either side of a 2" edge-grain hardwood middle section filler.

### OPTIONAL EQUIPMENT

**ENGINE:**

| | |
|---|---|
| Model | NRTO |
| Make & type | Cummins, turbocharged |
| Number of cylinders | Six |
| Bore and stroke | 5¼" x 6" |
| Piston displacement, cu. in. | 743 |
| Brake H.P. @ 2100 r.p.m. (gov.) | 335 |
| Max. torque @ 1500 r.p.m. | 900 lb.-ft. |

**TRANSMISSIONS:**
Westinghouse Converter and Mack 4-Speed Transmission. Clutch . 2-plate, 17", air actuated.
Allison Torqmatic Converter and Allison Transmission.
Twin Disc Converter and Mack 4-Speed Transmission.

**FRONT AXLE:** Special Heavy-duty, Reversed-Elliott, Drop Forged I-beam.

**TIRES:**

| | Front |
|---|---|
| Size | 14.00-24 (20P) Rib |

**BODY:**

| | |
|---|---|
| Type | Flared Quarry |
| Make | Heil |
| Capacity, line of plate | 15.2 cu. yds., struck |

**Construction:** ¼" steel plate shell bottom; ½" sides; ⅜" header; ½" wear and side bevel plates; ¼" canopy. 3" x 7.1 lb. channels between floor plates either side of a 2" edge-grain hardwood middle section filler.

**Body Equipment:** (for std. and opt. bodies): (9) ¾" x 6" alloy wear bars; rock ejectors; horizontal bolsters (3 per side); canopy toe board; rock guards over tires; canopy, loose for export shipment. (for std. body): welded-on side boards; exhaust heating connections.

**CHASSIS EQUIPMENT:** Air starting, Ingersoll-Rand 9HP; Tachograph, Wagner "BB" (24 hour chart 0-3500 r.p.m.) in place of standard Tachometer; Wig-Wag low air pressure indicator; hand control valve to operate rear service brakes; front wheel brake limiting valve; 25,000 B.T.U. hot water cab heater with defrosters; windshield fan mounted on windshield header; hub-odometer; engine chrome cylinder liners and stellite inlet valve seats; insulating dash mat; fender to bumper treads; air operated radiator shutter; air operated Thermo-controlled radiator fan hub; speedometer; back-up light; hydraulic jack, 30-ton; spare rims.

**NAME FOR TRUCKS**

# MACK LRSW

**capacity: 30 tons**

Powered by either a 300 or 335-horsepower engine, this 30-ton, six-wheel dumper has what it takes for off-highway operation in mines, quarries and earth-moving projects. Smooth application of power to its balanced, four-wheel drive bogie is obtained by an air-assisted clutch and overgear transmission with two-speed compound or torque converter.

Convenient location of controls, angle steering column, hydraulic steering booster, and extreme left driver position give easy and efficient handling. Best materials, precision manufacture, and specially engineered components make the LRSW capable of withstanding the toughest 'round-the-clock hauling.

## CONDENSED SPECIFICATIONS

### STANDARD EQUIPMENT

**DIMENSIONS:**

| | |
|---|---|
| Wheelbase | 16' 10" |
| Platform | 14' 11½" |
| Overall Width | 11' 2⅛" |
| Overall Height | 11' 6½" |
| Overall Length | 29' 2⅛" |
| Overall Height (Body Raised) | 24' 10" |
| Turning Circle Diam. (To outside edge of tire) | 78' |
| Weight (chassis, body & hoist) | 60,000 lbs. |
| Payload | 60,000 lbs. |

**ENGINE (Diesel):**

| | |
|---|---|
| Model | NHRBIS |
| Make | Cummins |
| Type | Supercharged |
| Number of cylinders | 6 |
| Bore and stroke | 5⅛" x 6" |
| Piston displacement, cu. in. | 743 |
| Brake horsepower @ 2100 r.p.m. (gov.) | 300 |
| Max. torque @ 1500 r.p.m. | 818 lb.-ft. |

**CLUTCH:**

| | |
|---|---|
| Type | Mack two-plate, dry |
| Area of engagement, sq. in. | 416 |
| Actuation | Manual, with air assist |

**ELECTRICAL SYSTEM:**

| | |
|---|---|
| Voltage and capacity | 12 V., 50 Amp. with 24 V., starting |

**TRANSMISSION:**

| | |
|---|---|
| Type | Mack two-lever, Duplex |
| No. of speeds, forward | Eight |
| reverse | Two |

**FRONT AXLE:**
Type . . . . Mack Reversed-Elliott, drop forged I-beam

**BOGIE:**

| | |
|---|---|
| Make | Mack Planidrive |
| Final drive, type | Four-wheel, planetary |
| Inter-axle differential, type | Mack concentric cam and plunger Power Divider |
| Carriers | Mack Dual Reduction |
| Total Ratio | 18.18 |

**BRAKES:**

| | |
|---|---|
| Type and actuation | Internal expanding, inclosed, air |
| Front, size | 17¼" x 5" x ¾" |
| Rear, size | 20" x 7" x ¾" |
| Hand, size | 15" x 5" x ⅜" |

**FRAME:**

| | |
|---|---|
| Type | I-beam, wide flange |
| Material | Alloy steel |
| Side-members, size | 13 15/16" x 8" with ⅜" web and top flange, ⅞" bottom flange |
| Section modulus | 84.5 per rail |

**SPRINGS:**

| | |
|---|---|
| Type, front | Semi-elliptic |
| rear | Semi-elliptic, inverted |
| Suspension, Mack | Rubber Shock Insulators |

**SHOCK ABSORBERS, FRONT:**
Type . . . . Houdaille, hydraulic

| TIRES (Lug): | Front | Rear |
|---|---|---|
| Size | 14.00-24 (20P) | 16.00-25 (20P) |

**WHEELS** . . . . Cast, spoke

**STEERING GEAR:**
Power steering assist . . . . Vickers hydraulic booster

**CAB:**
Type . . Heavy-duty off-highway, closed, all-steel, welded. Offset 10¼" to left of chassis center-line provides clear vision for driver to rear.

**CHASSIS EQUIPMENT:** Hubodometer; screen type radiator guard; front and rear tow pins; air horn; rear view mirror, left side; exhaust through hood with in-line muffler; channel type front bumper; door in hood side for access to oil filler and dip stick; insulating dash mat wig-wag low air pressure indicator; windshield wipers stop and tail light; back up light; rim lug wrench and handle; automatic radiator shutters.

**HOIST:**

| | |
|---|---|
| Make | Heil |
| Type | Twin, double-acting, 10" diameter hydraulic cylinders with 40" stroke, 70° dumping angle with power return. |

**BODY:**

| | |
|---|---|
| Make and type | Heil, Rock-scoop end |
| Capacity, line of plate | 21 cu. yds. |

**Construction:** ¼" steel plate shell bottom; ⅜" sides and header; ¼" slope section; ¼" alloy wear and side bevel plates; ¼" canopy. 3" x 7.1 lb. channels between floor plates either side of a 2" edge-grain hardwood middle section filler.

### OPTIONAL EQUIPMENT

**ENGINE:**

| | |
|---|---|
| Make and model | Cummins, NRTO |
| Number of cylinders | Six |
| Bore and stroke | 5⅛" x 6" |
| Piston Displacement cu. in. | 743 |
| Brake horsepower @ 2100 r.p.m. (gov.) | 335 |
| Max. torque @ 1500 r.p.m. | 900 lb.-ft. |
| Turbocharger | Turbine, exhaust driven |

**TRANSMISSIONS:**
Westinghouse Converter and Mack 4-Speed Transmission. Clutch—2-plate, 17", air actuated.
Allison Torqmatic Converter and Allison Transmission.

**WHEELS, TIRES:**

| | |
|---|---|
| Front & rear Wheels, type | Cast spoke |
| Tires, size | 16.00-25 |
| Ply-rating, front | 20 or 24 |
| rear | 24 |

**BODY EQUIPMENT:** (9) ¼" x 6" alloy wear bars; 1" alloy wear plate; rock ejectors; horizontal bolsters (4 per side); twin body prop; rock guards over tires; exhaust heating connections; canopy, loose (for export shipment).

**CHASSIS EQUIPMENT:** Air starting, Ingersoll-Rand 9HP; chrome cylinder liners and stellite inlet valve seats; air operated Thermo-controlled radiator fan hub; Tachograph, Wagner model "BB" (24 hour chart 0-3500 RPM) in place of standard Tachometer; speedometer; front wheel brake limiting valve; alcohol vaporizer; cab insulated; exhaust outlet under cab suitable for attachment to body for body heating; 25,000 B.T.U. hot water cab heater with defrosters; solex glass for windshield; windshield fan mounted on windshield header; fender to bumper steel treads; two stop-tail lights; 20-ton hydraulic jack; spare rim.

**MACK — FIRST**

# MACK LRVSW

**capacity: 34 tons**

The 34-ton rated capacity of this super-payload, six-wheel dumper assures minimum haulage costs for the big earth-moving jobs. Equipped with a 400-horsepower engine, four-speed overgear transmission, hydraulic torque converter or two-speed compound, and a balanced, four-wheel drive bogie, LRVSW's can negotiate severe grades fully loaded. Maneuverability and ease of handling are facilitated by such features as a hydraulic steering booster and air-assisted clutch. Heat-treated, stress-proportioned, single-unit frame gives the structural stamina needed to withstand severest operating conditions. All these features, and many more, contribute to unmatched durability and minimum haulage costs.

## CONDENSED SPECIFICATIONS

### STANDARD EQUIPMENT

**DIMENSIONS:**

| | |
|---|---|
| Wheelbase | 16' 10" |
| Platform | 14' 11½" |
| Overall Width | 11' 2⅜" |
| Overall Height | 11' 7⅝" |
| Overall Length | 31' 3⅛" |
| Overall Height (Body Raised) | 25' 2" |
| Turning Circle Diameter (To outside edge of tire) | 78' |
| Weight (chassis, body & hoist) | 68,000 lbs. |
| Payload | 68,000 lbs. |

**ENGINE (Diesel):**

| | |
|---|---|
| Model | NVH-1200 |
| Make | Cummins |
| Type | Naturally aspirated |
| Number of cylinders | 12 |
| Bore and stroke | 5⅛" x 6" |
| Piston displacement, cu. in. | 1486 |
| Brake horsepower @ 2100 r.p.m. (gov.) | 400 |
| Max. torque @ 1200 r.p.m. | 1,075 lb.-ft. |
| Fuel tank and location | 150 gal., back of cab |

**CLUTCH:**

| | |
|---|---|
| Make | Lipe Rollway |
| Type | Two-plate, dry |
| Area of engagement, sq. in. | 571 |
| Actuation | Air |

**ELECTRICAL SYSTEM:**

| | |
|---|---|
| Voltage and capacity | 12 V., 75 Amp. |
| Generator, make and type | Leece-Neville, alternator |

**STARTING SYSTEM:**

| | |
|---|---|
| Starting motor, type | Air |
| Make | Bendix-Westinghouse |
| Rating, horsepower | 25 |
| Cold starting aid | Ether injection |

**TRANSMISSION:**

| | |
|---|---|
| Type | Mack selective constant mesh |
| No. of speeds, forward | Four |
| reverse | One |

**TORQUE CONVERTER:**

| | |
|---|---|
| Model | Westinghouse 18" |
| Type | Single stage, hydraulic |

**FRONT AXLE:**
Type . . . . Mack Reversed-Elliott, drop-forged I-beam

**BOGIE:**

| | |
|---|---|
| Make | Mack Planidrive |
| Final drive, type | Four wheel, planetary |
| Inter-axle Differential | Mack concentric cam and plunger type Power Divider |
| Carriers | Mack Dual Reduction |
| Total ratio | 18.18 |

**BRAKES:**

| | |
|---|---|
| Type and actuation | Internal expanding, inclosed, air |
| Front, size | 17¼" x 5" x ¼" |
| Rear, size | 20" x 7" x ¼" |
| Hand, size | 12" x 5" x ⅛" |

**FRAME:**

| | |
|---|---|
| Type | I-beam, wide flange |
| Material | Alloy steel |
| Side-members, size | Depth 14¼", flange width 8", flange thickness 1" |
| Section modulus | 130.0 per side |

**SPRINGS:**

| | |
|---|---|
| Type | Semi-elliptic |
| Suspension, Mack | Rubber Shock Insulators |

**SHOCK ABSORBERS, FRONT:**
Type . . . . Houdaille, hydraulic

**TIRES (Lug) Front and Rear:**
Size . . . . 16.00-25 (20P)

**WHEELS:**
Type . . . . Cast, spoke

**STEERING GEAR:**

| | |
|---|---|
| Type | Worm and roller |
| Power steering assist | Vickers hydraulic booster |

**CAB:**
Type . . Heavy-duty off-highway, closed, all-steel, welded. Offset 10⅛" to left of chassis center-line provides clear vision for driver to rear.

**CHASSIS EQUIPMENT:** Screen type radiator guard; hubodometer; front and rear tow pins; air horn; rear view mirror, left side; dual exhaust through hood with inline mufflers; channel type front bumper; rim lug wrench and handle; door in hood side for access to oil filler and dip stick; insulating dash mat; windshield wipers; stop and tail light; back up light, automatic radiator shutters.

**HOIST:**

| | |
|---|---|
| Make & Type | Heil, twin, double-acting, outboard mounted, four-section telescopic cylinder assembly directly connected to body and chassis through a universal joint arrangement to provide maximum flexibility. |
| Dumping angle | 70° |

**BODY:**

| | |
|---|---|
| Make & Type | Heil Rock, scoop end |
| Capacity, line of plate | 24 cu. yds. struck |

**Construction:** ¼" steel plate shell bottom; ⅛" sides and header; ¼" alloy wear and side bevel plates; ½" front slope plate; ¼" canopy. 3" x 7.1 lb. channels between floor plates either side of a 2" edge-grain hardwood middle section filler

### OPTIONAL EQUIPMENT

**TRANSMISSION (In place of 4-Speed and Westinghouse Converter):**

| | |
|---|---|
| Make & Type | Mack Two-Lever, Duplex |
| Speeds Forward | 8 |
| Speeds Reverse | 2 |

**TIRES (Lug) Front and Rear:**
Size . . . . 16.00-25 (24P)

**BODY EQUIPMENT:** (9) ¼" x 6" wear bars over standard ¼" alloy wear plate; 1" alloy wear plate in place of ¼" alloy wear plate; exhaust heating; rock ejectors; rock guards over tires; twin body prop; horizontal bolsters (5 per side).

**CHASSIS EQUIPMENT:** Air operated Thermo-controlled radiator fan hub; Tachograph, Wagner model "BB" (24 hour chart 0-3500RPM) in place of standard Tachometer; speedometer; front wheel brake limiting valve; alcohol vaporizer; 25,000 B.T.U. hot water cab heater with defrosters; solex glass for windshield; windshield fan mounted on windshield header; fender to bumper steel treads; cab insulated; two stop-tail lights; spare rim; 20-ton hydraulic jack.

# only MACK gives you features like these...

### MACK-BUILT FRONT AXLES

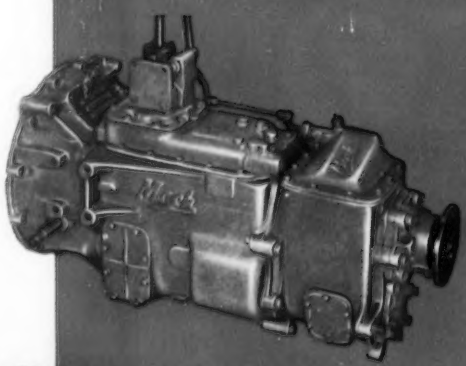
Mack's reversed Elliott, drop-forged I-beam front axles are made extra strong for long, trouble-free service. Extensive use of heat-treated steels for crucial parts means minimum maintenance. Straight tie rod and rugged construction of air-actuated brake shoes insure top performance.

### MACK-BUILT 2-WHEEL REAR AXLES

Mack's two-wheel, rear axle assemblies have an unmatched reputation for durability under strenuous service. The strongest, most wear-resistant materials are used throughout. Dual Reduction, gear-type differential and Mack's famous planetary gear reduction at the wheel hubs (Planidrive) provide the smooth distribution of power needed for top truck performance. Planetary gears can be serviced or repaired without removing tires or disturbing wheel bearing adjustment.

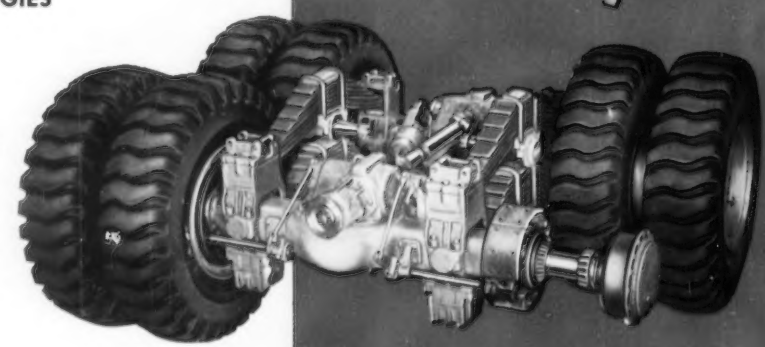
### MACK-BUILT TRANSMISSIONS

Dependable performance and long life are standard in Mack transmissions. Shown here is the heavy-duty overgear transmission used for the LRVSW, LRSW, and LVX off-highway dumpers. The four-speed main transmission and two-speed compound are assembled as a unit to give eight forward and two reverse speeds. The four-speed main transmission without the two-speed compound is offered in combination with torque converter. All gears use Mack tetrapoid or quadrapoid tooth design and are drop-forged and case-hardened . . . gears noted for lasting the life of the truck.




### MACK-BUILT 4-WHEEL BALANCED BOGIES WITH EXCLUSIVE POWER DIVIDER

Under the worst conditions of mud, loose gravel, or difficult terrain, you get maximum pulling power with Mack's four-wheel drive Balanced Bogies because exclusive Mack Power Dividers apply power to the wheels with traction. Planidrive final reduction gears in all four hubs provide needed reduction without excessively large carriers, differentials, or axle shafts. Maintenance is reduced to a minimum.



## MACK first name for TRUCKS

**Mack Trucks, Inc., Plainfield, New Jersey • In Canada: Mack Trucks of Canada, Ltd.**

## In ore concentration . . .

# Stearns magnetic separators give you

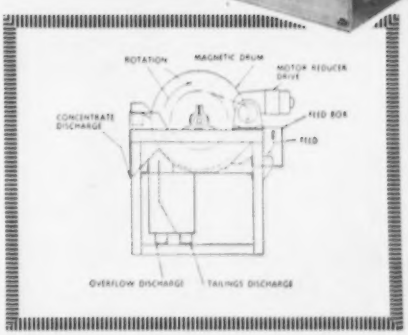
- **BIG CAPACITY**
- **POSITIVE SELECTIVITY**
- **LOW-COST OPERATION**

## Wet Concentration

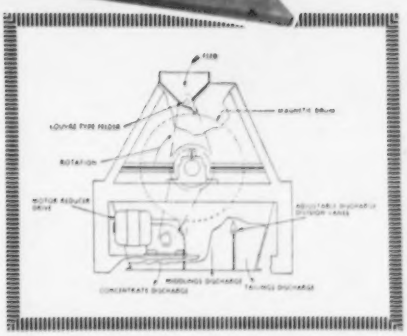
Designed for efficient cobbing or roughing of iron ores, the Stearns Wet-Type Magnetic Drum Separator handles up to 600 GPM of magnetite slurry—particle sizes from ⅜ in. to fines. High recovery rate assures speed and economy in production not possible with other concentration equipment.

The magnet assembly produces a deep, powerful field with ideal flux distribution across the rotating drum surface. Transportation of magnetic material is positive and selective, magnetic discharge is clean and highly concentrated.

Operation and maintenance of the Stearns Wet-Type Separator is simple. One man can easily handle multiple units, keep production going with a minimum of attention. Type WPD Separator, with permanent magnet drum, requires no electrical energization. Electromagnetic unit, Type WED, may be specified where control of magnetic field is desirable. Type WED is available in six drum widths, from 12 in. to 72 in.; five drum widths are available for the WPD, from 15 in. to 75 in. Write for your free copy of Bulletin 2011-D.




**Stearns Type WPD Magnetic Separator**




**Stearns Type MD Magnetic Separator**

## Dry Concentration

Low-cost, efficient separation of magnetite is a specialty of the Stearns Type MD Magnetic Drum Separator. High-purity magnetic concentrates are obtained from dry feeds up to 25 tons per hour per foot of magnet width. Material size from 1½ in. down to fines can be handled with outstanding efficiency.

The design of the MD Separator assures a clean, high-grade magnetic product. Magnetite is drawn out and conveyed on the drum surface through ten magnetic fields of alternating polarity. This agitates and reorients the magnetic material, frees entrapped non-magnetics and produces an exceptionally pure concentrate. Discharge is controlled to obtain magnetics, non-magnetics and a middling product that may be rejected or reprocessed.

The Stearns MD Separator requires very little driving power — only 2 hp for the largest unit. Thirty-inch drums, mounted on anti-friction bearings, are available in widths of 12 in., 24 in., 30 in., 36 in. and 48 in. You can specify electro or permanent magnet assembly to suit your needs. Write for your free copy of Bulletin 85-D.

10

*Whatever your separation, purification or concentration problems, your Stearns representative will be pleased to help you select a separator that will give efficient performance and long service at low cost. See him soon.*

**STEARNS MAGNETIC PRODUCTS**

A DIVISION OF THE INDIANA STEEL PRODUCTS COMPANY • VALPARAISO, INDIANA

635 South 28th Street • Milwaukee 46, Wisconsin

*Power shovel breaks down . . .*

# So quarry moves boulders with

**All over the country, more and more dirtmovers are finding Michigan Tractor Shovels can effectively handle jobs once considered much too tough for rubber-tired equipment.**

**You've probably read about—or seen—Michigans digging pit-run gravel. Or breaking out reinforced concrete. Or clearing brush. Now here's another dramatic application.**

## Maintains pit production

The company involved, a large northeastern firm, had always had trouble maintaining pit production when any of their big power shovels broke down. One time this happened, they had a Michigan Tractor Shovel in the pit on demonstration. They decided to put it through the rugged test of rock loading.

## Now own six Michigans

That was in 1954. Today, this company owns *six Michigan Tractor Shovels!* In emergencies these units effectively handle both rock loading and cleanup. They also handle *all* truck-loading of screened aggregates and other products of the multi-million-ton crushed stone plant. Management estimates their output "definitely greater" than output of loaders formerly used. Maintenance costs, over periods ranging up to three years, have been "satisfactorily low".

## Boulders weigh up to 7 tons each

Note the photos. Above, one of the company's five 2¾ yard Michigan Model 175A's is moving huge boulders to stockpile for later sale as rip-rap. Each chunk weighs ½ to 7 tons . . . yet at no time has operator reported trouble handling them. Upper right, another Model 175A loads shot rock at the quarry face. Michigans' unobstructed dumping height, power shift, and power steer helps speed both emergency assignments.

## Load 10 tons in 2 to 3 minutes

Stockpile loading (lower right) keeps the company's

This is the type of shot rock that must be loaded into trucks for transport to crushers. Michigan Tractor Shovels must be able to take a lot of punishment—and they do!

A full bucket every time saves trips, cuts handling costs of loading crushed stone or sand. This load weighed out at 7,000 lbs. This model Michigan can lift 15,000 lbs.

# 2¾ yard Michigan

2 yard Model 125A and most of the 2¾ yard Model 175A's busy most of the time. Good mobility and unexcelled breakout, *equally great* through the entire lifting arc, make quick work of this job. The Model 125A needs only 3 minutes to heap a typical 10 yard truck . . . the bigger Model 175A's require only 2 to 2½ minutes.

## 24 mph travel speeds odd jobs

Michigan speed pays off on odd jobs, too. Like cleanup of haul roads, stockpiles, and around crushers. Pushing loaded trucks up grade. Setting utility poles. Hoisting crusher screens and other heavy equipment. Switching railroad cars (up to 25 empties at once). Plowing and removing snow. Despite year-around work averaging 50 hours a week, company officials report "downtime negligible." And continuing, "The all-Clark-built, all-matched power train sure boosts efficiency. From power shift, power steer and 3-to-1 torque converter to planetary wheel drive axles . . . our '54 model has the same components as our newest rig . . . which certainly proves how good the Clark design is. We like the speed of loading . . . the speed between job sites . . . the excellent performance on emergency rock-handling . . . the lack of downtime . . . the ease of maintenance. That's why we've been repeat-buyers five times!"

## Make your own test

A demonstration, gladly arranged by your local Michigan Distributor, will show you why you too should be a Michigan Tractor Shovel buyer. Put the demonstrator on your toughest loading jobs . . . we'll bet *our cost* of the demonstration *against your time* you'll really be *enthusiastic* about the results.

Michigan is a registered trade-mark of

CLARK® EQUIPMENT

**CLARK EQUIPMENT COMPANY**
**Construction Machinery Division**
**2465 Pipestone Road**
**Benton Harbor 42, Michigan**
**In Canada: Canadian Clark, Ltd., St. Thomas, Ontario**

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4363

*If any of your work is in sandy soil, you well know all the maintenance tracks need. This New Jersey company figured they spent $22,000 in parts alone every year. So they switched to rubber, now*

# SAVE BIG REPAIR BILLS, GET MORE WORK DONE!

Bennett Sand & Gravel Company, Manasquan, New Jersey, qualify as *real experts* on track wear. All their work is in gravel or high-silica sand, which forms the floor of their 1,000 acre quarry. In the past, they figured re-bushing and new sprockets were needed on each of their crawler-dozers twice a year. Complete sets of rails had to be replaced every eight months. Rebuilding jobs on three crawler dozers cost over $22,000 per year *in parts alone.* Shop time for the track repairs totalled *400 to 500 man-hours per year.* To eliminate this high cost, Bennett decided to try rubber. Their local Michigan Distributor heard about it, got permission to demonstrate a Model 180 Tractor Dozer. Bennett management liked it so well, they insisted it stay right on the job.

## "Tires don't wear out"

The Michigan started to work in summer, 1956. To date, the tires show virtually no wear. Paul Bennett, Jr., Company Vice President, says he expects them to "last indefinitely." For comparison, he points to a tractor loader which has worked constantly and still has original tires after 6 years. A bottom-dump hauler has original treads after 9 years. So, Bennett figures, the tires on their Michigan dozer, with its steerable wheels, should be good for thousands of hours. The machine does everything, too . . .

## Spread at 6 scattered dumps

Its regular jobs include:

1. Keeping three big sand dumps pushed off. Types of sand: mason, concrete and coarse grade. Job was once tried by another make of rubber-tire dozer, but it bogged down hopelessly in the often-wet sand.
2. Spreading truck-dumped gravel at three dumps: pea-size, ⅜" and 1" stone. Major advantage in this operation is way Michigan's low-pressure tires don't crush the gravel . . . a real problem with crawlers when selling gravel for state work.
3. Cleaning spillage from haul roads.
4. Cleaning around washer.
5. Building roads at secondary pit five miles away. Unit gets to this assignment *under its own power* at 27 mph.

## "Easier to run than crawlers"

"We do about 50 kinds of odd jobs, as well," says John Gifford, a dozer operator with Bennett *since 1940.* "The Michigan is a pleasure to run all the time. Hit a good-sized stone while driving a crawler, for instance, and you really get a jar. In our Michigan, you roll right over it, stay in perfect control. It's a cinch to operate the Michigan after running a crawler—and a lot faster too. *Michigan gets around the plant as fast as a truck,* handling dozens of jobs—doing well at all of them!"

## Available on lease-purchase

If slow speeds and sand-in-the-tracks are grinding away at your profits, it will pay you to get full facts on this Dozer. Your local Michigan Distributor will be glad to arrange a trial demonstration—*you* pick the job. You *needn't* keep the Michigan we demonstrate . . . but we guarantee if you have any work in sandy soil, or any scattered odd jobs, you'll be tempted. All sorts of purchase plans can be arranged . . . including no-money-down, pay-as-you-profit lease-purchase.

Michigan is a registered trade-mark of

**CLARK EQUIPMENT COMPANY**
**Construction Machinery Division**
**2465 Pipestone Road**
**Benton Harbor 36, Michigan**
**In Canada: Canadian Clark, Ltd.**
**St. Thomas, Ontario**

**CLARK® EQUIPMENT**

# NORDBERG MACHINERY

## ...engineered for large volume, quality production of ores and industrial minerals

The entire line of heavy-duty Nordberg Mining Machinery has been engineered and built for one basic purpose . . . to meet the mining industry's expanding demand for low cost, quality production and processing of large tonnages of metallic and non-metallic ores and industrial minerals.

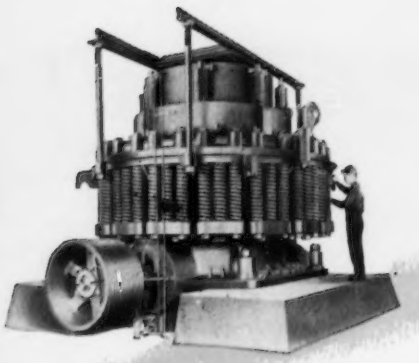
The many years of specialized experience gained by Nordberg in working closely with the mining fraternity has resulted in continual design and operational improvements which have consistently made Nordberg Machinery first choice among the world's leading ore and mineral producers.

As illustrated, Nordberg Mining Machinery includes Symons® Gyratory Crushers for primary breaking, Symons Cone Crushers for secondary and tertiary crushing, Nordberg Mills for wet or dry grinding, Symons Vibrating Grizzlies and Screens for scalping and sizing, and Nordberg Engines for mine and mill power.

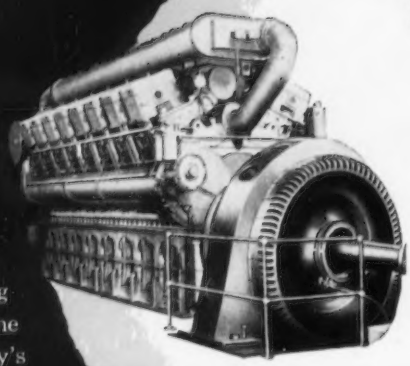
*Write for literature on the Nordberg Machinery you need to efficiently produce large tonnages of ores and industrial minerals at lower cost per ton.*

SYMONS A Registered Nordberg Trademark known throughout the world

**NORDBERG MFG. CO.**
Milwaukee, Wisconsin



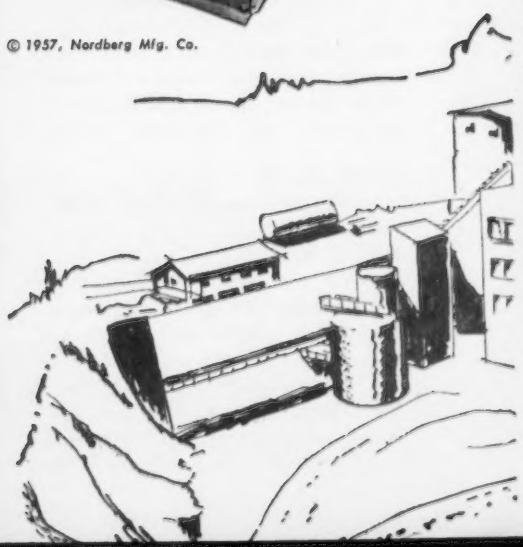
**SYMONS CONE CRUSHERS**
Built in both Standard and Short Head types, in sizes from 22" to 7' in diameter, in capacities from 6 to 900 or more tons per hour.



**NORDBERG ENGINES**
Ranging from small power units to large stationary engines. Nordberg engines are built in types for Diesel, Duafuel® and Spark-Ignition Gas operation, in sizes to over 12,000 horsepower.

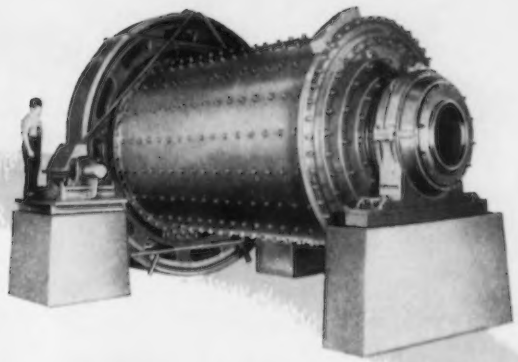
**SYMONS ROD DECK SCREENS**
Highly efficient screening surface of spring steel rods—easily replaced. Especially suited for wet, sticky materials.

© 1957, Nordberg Mfg. Co.



**SYMONS® PRIMARY GYRATORY CRUSHERS**

Built in 30″, 42″, 48″, 54″, 60″ and 72″ feed opening sizes, for capacities to 3500 or more tons per hour.

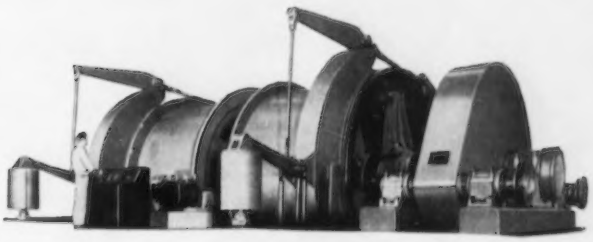


**NORDBERG GRINDING MILLS**

Built for wet or dry, open or closed circuit operation . . . including Rod, Ball, Pebble, Tube and Compartment types, in sizes from 6′ to 13′ dia., up to 50′ in length.

**NORDBERG MINE HOISTS**

Built in both friction and drum types for hoisting both ore and men. These dependable hoists are widely used in large coal and metal mining operations.

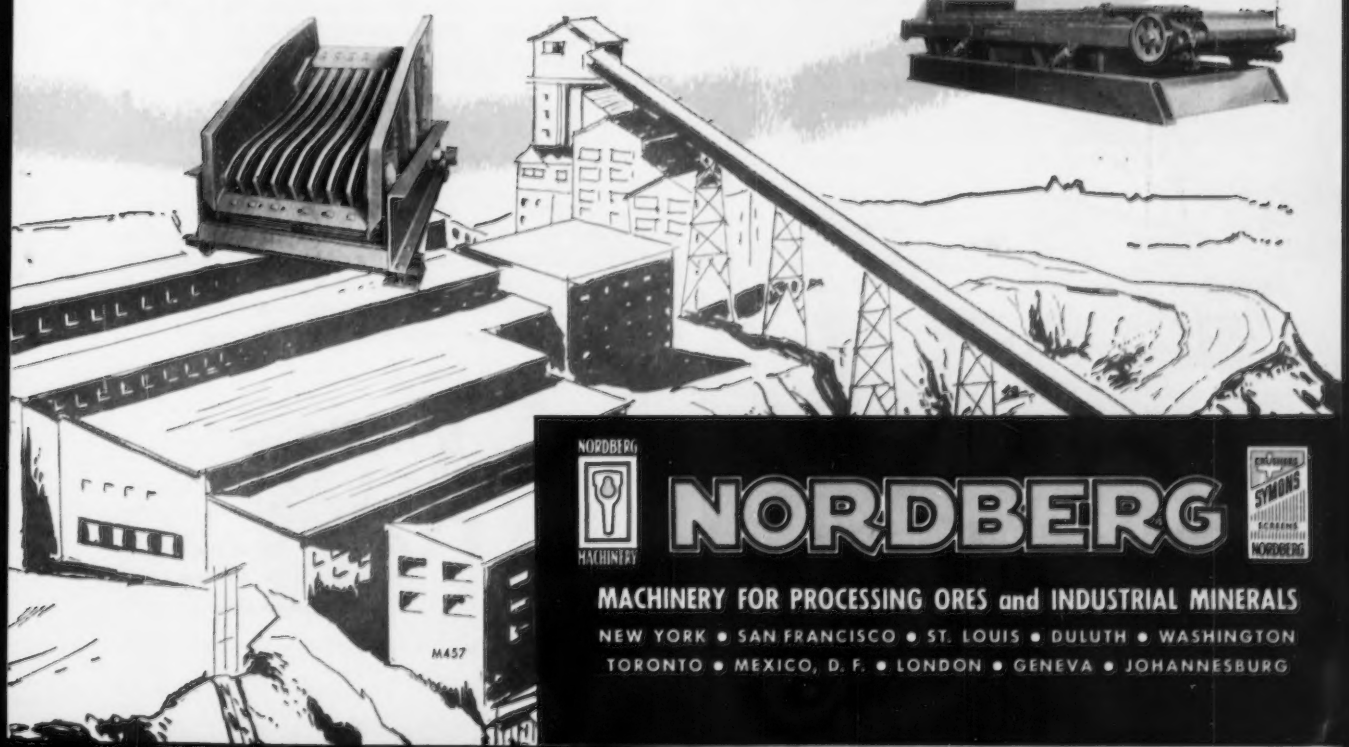


**SYMONS VIBRATING BAR GRIZZLIES**

Built for heavy duty large capacity primary scalping service. Particularly effective when handling wet, sticky or gummy ores.

**SYMONS HORIZONTAL VIBRATING SCREENS**

Permit level, large capacity screening of extreme accuracy. Built in single, double and triple deck types in a wide range of widths and lengths.




NORDBERG MACHINERY

# NORDBERG

CRUSHERS SYMONS SCREENS NORDBERG

**MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS**

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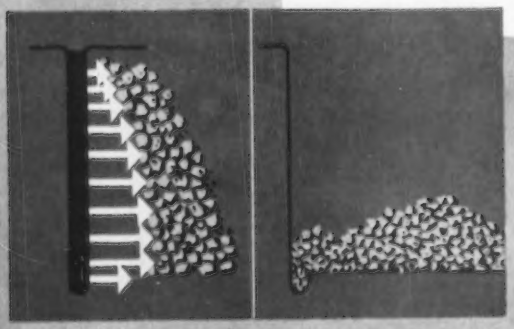
# HERE'S A NEWS BULLETIN

*This technical bulletin contains information that can help you get quieter, more efficient blasts.*

*Every issue contains discussions on important blasting problems by D. M. McFarland, manager of the Technical Customer Service Section.*

*New, improved blasting procedures are graphically explained. New materials are reviewed and evaluated.*



## *To keep users of explosives posted on the latest in blasting developments*

You'll be up on new explosives products and blasting techniques that can give you more efficient, economical results when you become a regular reader of "*Better Blasting.*"

"*Better Blasting*" is published as a technical service by Atlas Powder Company. Each quarterly issue contains important safety information and such features as loading procedures that pay off in better shots . . . methods that minimize noise and vibration, and assure improved public relations.

You'll especially look forward to "Mac's Notes," an interesting column by Dave McFarland, often called "the father of millisecond delay blasting."

Start "*Better Blasting*" coming your way—free of cost or obligation. Write Atlas to put your name on the mailing list.

Ask also about the new Atlas safety movie, "*How to Handle Women and Explosives*" . . . or the public relations film, "*We're Blasting Near You,*" which you can show to your neighbors to illustrate your efforts to minimize disturbance.

EXPLOSIVES DIVISION
ATLAS POWDER COMPANY
WILMINGTON 99, DELAWARE
*offices in principal cities*

# NEW... JOY HARDROCK SHUTTLE CAR

## PROVIDES RUGGED HAULAGE SERVICE FOR METAL AND NON-METALLIC MINING

Economical high-tonnage hauling of hard, abrasive rock has been a challenge for any shuttle car . . . now the new electrically powered Joy 14-RC meets this challenge. It's designed and built for rugged, demanding service.

Start with planetary gear reduction within each wheel . . . add ventilated hydraulic disc brakes; safe mechanical parking brakes; and Joy-proved four-wheel drive and four-wheel power steering . . . include up to 80 HP positive traction drive; a powerful reversible conveyor with replaceable wear plates and hydraulic clutch . . . and tie it all together with an extra-rugged reinforced steel frame and body.

It all adds up to a shuttle car that hauls 15 tons up a 34½% grade . . . and has the capacity to haul really profitable payloads . . . the perfect teammate for the Joy 18 and 19 series hard-rock loaders.

The Joy 14-RC has almost 20 years of shuttle car experience behind it . . . ever since '38 when Joy introduced and proved shuttle car haulage. The 14-RC is now at work on many jobs, including one of the world's largest uranium mines.

A diesel-mechanical version of the 14-RC, the Joy 19-RC, is now available. It has equal grade climbing ability, and a considerably higher tramming speed on level roadbed.

*Joy 14-RC shuttle car empties a full 15-ton load in less than 60 seconds.*

Get help on *your* haulage problems from the leader in the field. ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

WSW M 6793-194

**JOY ... EQUIPMENT FOR MINING ... FOR ALL INDUSTRY**

FOR FURTHER INFORMATION WRITE FOR BULLETIN

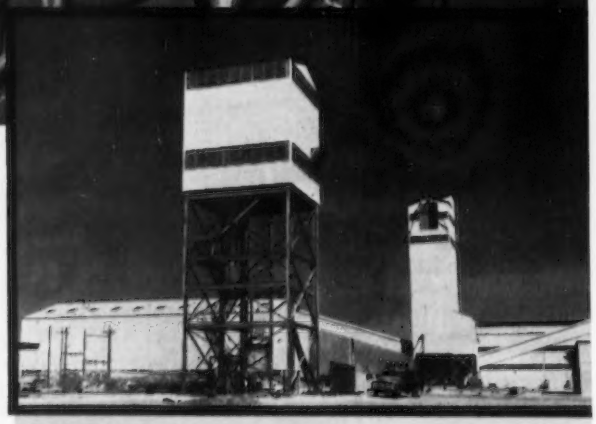
STATIONARY COMPRESSORS

TRACKLESS LOADERS

AIR LEGS

FANS AND PORTABLE BLOWERS

# NEW ASEA MULTI-ROPE FRICTION HOISTS INSTALLED BY NATIONAL POTASH



Once again, attention of American mining men has been focussed on the superior economy and safety of the new ASEA multi-rope friction-drive hoisting method.

Latest ASEA hoist installation has been made by the National Potash Co. at Carlsbad, New Mexico. Fully automatic in operation and loading, an ore hoist and a service hoist are mounted in two head frames. Skip load is 10 tons; maximum speed, 1,250 ft. min.; maximum depth, 1,850 ft.

An ever-growing number of ASEA hoists is being installed throughout the U. S. and Canada.

**You will want to look into these ASEA advantages:**

COST LESS TO INSTALL AND OPERATE

1. Smaller diameter and narrow width of pulley give low unit weights and reduced inertia.
2. Compact size and low weight permits installation in head frame above shaft.
3. Above factors result in lower initial capital and operating cost.

SAFER

1. Several parallel ropes are used instead of a single rope.
2. Safety wedges on shaft guides positively prevent overwind.

SAVE ROPE WEAR

1. Less rope wear due to elimination of fleet angle, absence of S-bends, and elimination of cross-overs which are used in multilayer practice.

Illustrated booklets on ASEA mine hoists are available on request.

ASEA equipment is sold and serviced in the U. S. by:

**AROS ELECTRIC, INC.**

500 FIFTH AVENUE, NEW YORK 36, N. Y.

this is the **TS-360**

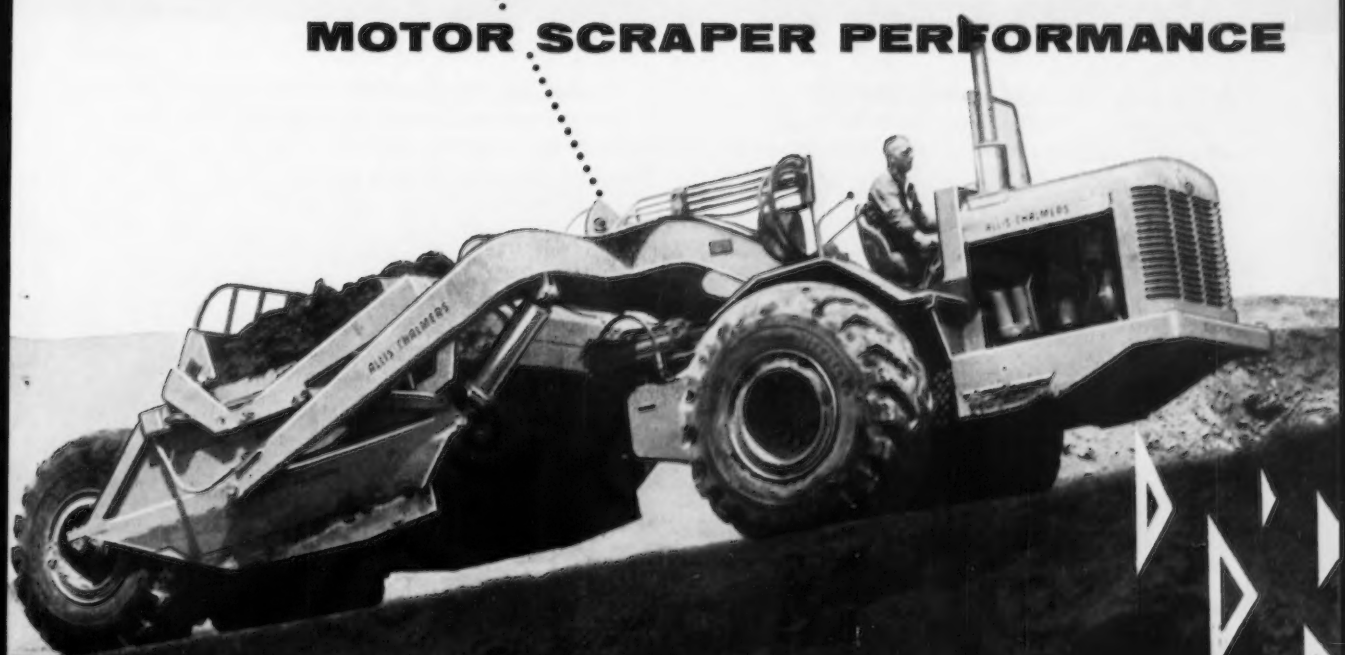
15 yd struck
20 yd heaped
280 horsepower

this is the **TS-260**

11 yd struck
14 yd heaped
200 horsepower

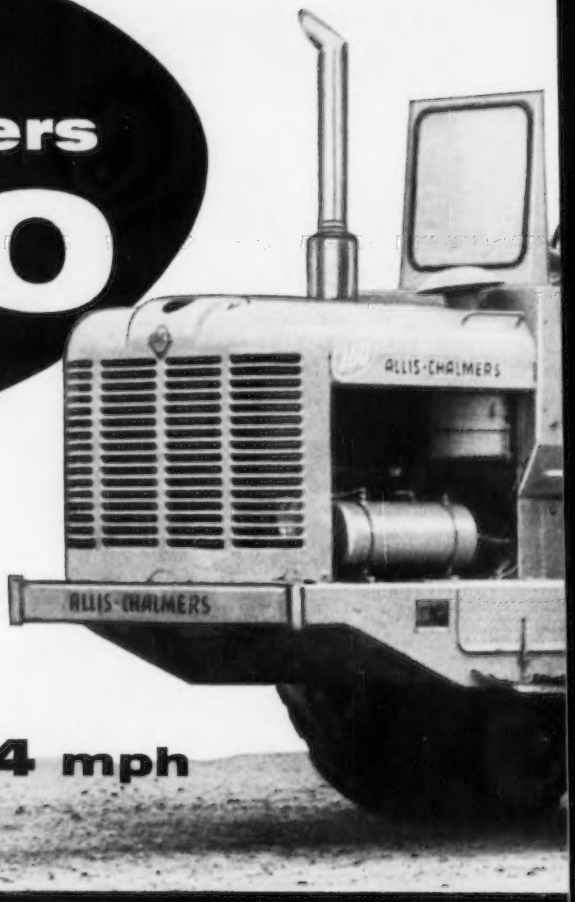
**now...**

**ALLIS-CHALMERS BRINGS YOU ANOTHER NEW MEASURE OF MOTOR SCRAPER PERFORMANCE**




# the TS-160

# NEW Allis-Chalmers TS-160




**7 yd struck**

**9.5 yd heaped**

**155 horsepower**

**5 speeds to 25.4 mph**

**12-ton payload**

## Measure these advantages for

**22 hp per struck yard**—Big Allis-Chalmers supercharged diesel engine delivers extra lugging ability for tough pulls, fast loading. Versatile TS-160 can team up with big equipment or work alone on long- or short-haul stripping jobs—handle a wide range of utility jobs, travel at speeds up to 25.4 mph.

**Measure these features** . . . Allis-Chalmers 516-cu-in. diesel engine—dependable power at all working speeds • Independent, constant live hydraulic power for steering and scraper operation • Low, wide bowl—8-ft, 1½-in. cutting edge . . . 3-piece, interchangeable cutting edges . . . double-acting hydraulic bowl lift jacks • Positive hydraulic ejection, high apron lift to full 7-ft, 1½-in. opening • Roomy operator's compartment, easy-to-reach controls, 24-volt direct electric starting, adjustable bucket-type seat, synchronized 4-wheel air brakes • Big push block for all types of pushers—positioned for in-line push • Full-circle visibility while loading, spreading and traveling . . . operating ease under all conditions • 17¼-in. minimum ground clearance in hauling position.

# a wide range of earthmoving jobs . . .

**Turns non-stop in less than 25 ft** with 90-degree hydraulic steering . . . easy maneuverability in narrow cuts, faster cycles without reversing in tight turn-arounds.

**Moves quickly from job to job . . .** when required, transport wheels are available to meet legal load limits for highway travel.

**Allis-Chalmers, Construction Machinery Division**
**Milwaukee 1, Wisconsin**

**ALLIS-CHALMERS**

**Engineering in Action**

**GENTLEMEN:** Have the Allis-Chalmers Construction Machinery dealer serving my area arrange a demonstration of the TS-160 motor scraper for me ☐.

Name_____

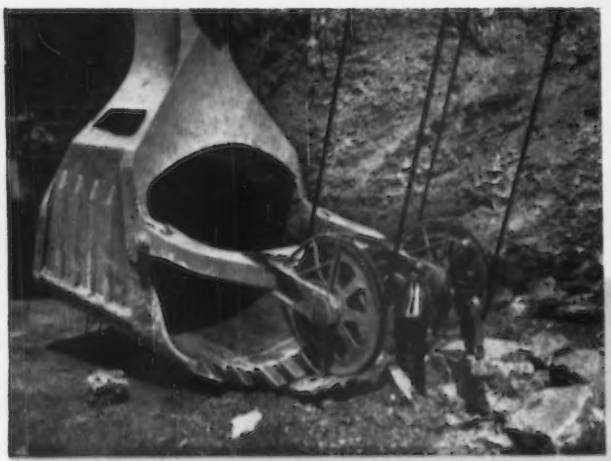
Address_____

City_____ State_____

Type of work_____

# Every year, THE WORLD'S

**THE WORLD'S LARGEST SHOVEL,** built by Marion Power Shovel Company for coal stripping operations, scoops 65 cubic yards at a bite.



**DIPPER HOIST ROPES** are 2½"-diameter Tiger Brand 6 x 49 Excellay Preformed.

**TIGER BRAND** 3⅝" boom-support strand has been used by coal companies since 1949 and has proved safe in service on big shovels.

# LARGEST SHOVEL could load a train 3,460 miles long

THE world's largest shovel moves an average of 1,614,530 cubic yards of overburden a month. In 12 months, this would fill a train of 70-ton coal cars 3,460 miles long.

**The wire rope** that performs this miracle is USS American Tiger Brand 6 x 49 Lang Lay Monitor Excellay with Independent Wire Rope Core. Two ropes 2½" in diameter and 580 feet long hoist the huge bucket that scoops up 90 tons at a bite.

The shovel can deposit a load in 45 seconds and be ready for the next scoop. This is one reason for the high production rate.

**The boom supports** have a catalog strength of 768 tons each, making a total of 3,072 tons for the four strands. These consist of 115-foot lengths of 3⅝-inch Tiger Brand Galvanized Boom Support Strand. The big advantage of boom-support strand over wire rope for this application is that if any breaks occur in individual wires, they show up first on the outside layers and are clearly visible.

The use of 3⅝"-diameter strand for boom supports on large shovels was introduced in 1949 as a result of the combined studies of coal company engineers with those at American Steel & Wire. It is a proven boom-support assembly which has become increasingly popular. Let us give you the facts.

**THE BIG BOOM** is 150 feet long and is supported by four 3⅝"-diameter Tiger Brand Galvanized Boom Support Strands with a minimum breaking strength of 768 tons each.

AMERICAN STEEL & WIRE DIVISION

United States Steel, General Offices: Cleveland, Ohio

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors

Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors • United States Steel Export Company, New York

**USS AMERICAN TIGER BRAND WIRE ROPE**

*Excellay Preformed*

USS

UNITED STATES STEEL

# how to get the most out of HOLLOW DRILL STEEL

Detachable carbide insert bits are a cost-cutting tool for the hard rock driller. But their use presents problems to the blacksmith. One problem is the premature failure of the attachment on the drill rod. When that happens, time is wasted in trying to recover the bit and, often, valuable bits are lost.

But, with new alloy steels such as Crucible CA DOUBLE DIAMOND or 4E, plus careful control of operations in the forge shop, you can keep failures to a practical minimum.

## *For example, prevent* SCALING OF THREADED SECTION

Excess scaling may produce undersize threads, loose fitting bits and ultimate mechanical failure of the drill rod due to poor stress distribution. Here are a few precautions to take to prevent excess scaling:

***TIME AND TEMPERATURE—***

Of primary importance are the time and temperature which the heat-treater selects for the job. Although they will vary somewhat with the composition of the steel and the size of the rod, time and temperatures should be selected which are the minimum at which the desired result can be obtained. Excess furnace time or temperature will result in excessive scale formation.

***FURNACE ATMOSPHERE*** – Avoid a highly oxidizing flame. The higher the excess oxygen content, the greater the tendency for scale and decarburization to form. And a reducing flame leads to carburizing brittle threads. The furnace best operates with a "soft" smoky flame or under near neutral conditions.

***SCALE REMOVAL—***

Scale is abrasive, and unless what scale does occur is removed, thread wear results. Wire brushing is a fast, convenient and safe method for removing scale.

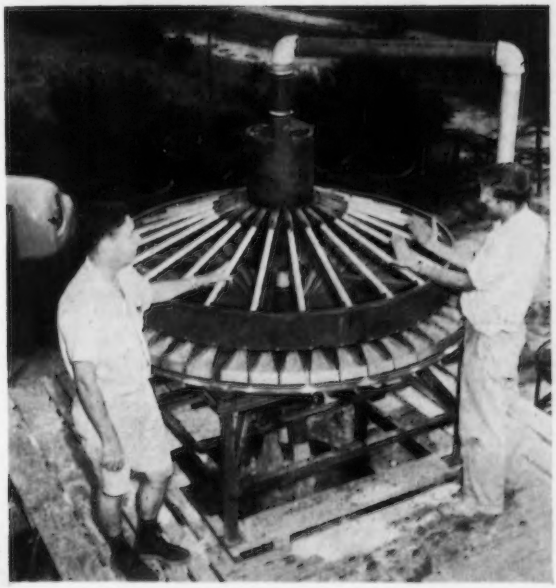
Crucible hollow drill rods are tough, strong—made to tool steel standards. Their *extra* quality means less rod breakage—fewer valuable bits lost. So specify Crucible hollow drill rods for your next job. They're quickly available in the sizes, types and grades you need. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

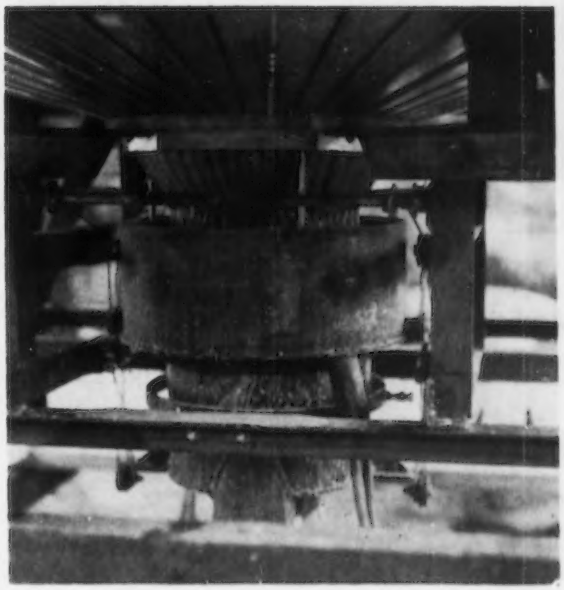
**CRUCIBLE** first name in special purpose steels

**Crucible Steel Company of America**

# E&MJ NEW PRODUCTS DIGEST

James W. Franklin





### Union Carbide to Install Cannon Separators at Beach Sand Operation (2)

Twenty Cannon Separators will be installed in Union Carbide's Amelia Island, Fla., beach sand operation now under construction. Separator, designed by Frank Cannon, has a capacity of 25 to 45 tph, depending on particle size of the feed. Unit can be fed from above or below, through a feed pipe. Feed enters the distribution header, then passes onto the many stainless steel sluices where it flows by gravity toward the central splitter gates. Heavy minerals stratify in the slow moving current, and the feed is cut into tails, middlings for recirculation, and rougher concentrate by the adjustable circular splitter gates. Machine has no moving parts and all wear surfaces are rubber covered.

### Aerial Color Photography (3)

Hycon Aerial Surveys, Inc. is now using color film in its aerial mapping cameras. Film is Eastman Ektachrome, and mapping costs are slightly higher than with black and white film, but color offers better opportunity to pick out mineralized zones from the air that black and white film misses.

### Small-Scale Alidade (4)

No. 9179 alidade by David White Instrument Co., is especially suited for small-scale topographical surveys. It is sturdy, accurate and reasonably priced. Telescope is 10 in. long, 10X power. Carrying case, plane table and tripod.

### Core Racks and Trays (5)

Trays and racks are available for core storage of 1-, 1⅛-, 1⅝ and 2¼-in. cores. These racks will handle up to 42 ft of 1-in. core and 24 ft of 2¼, according to Tomco Products.

### Survey Meter (7)

Portable radiation monitor produced by Instrument Division, Eteco Ltd. is only 1¼x3½x7¼ in. in size and weighs but 1½ lb with batteries. Survey Meter Type 125 has both visual and audial gamma radiation indicators. Uses internationally available batteries, such as Ever-Ready Type U2.

### Exploration Seismograph (6)

Model MD-1 Refraction Seismograph can be used for determining depth to bedrock, the presence or absence of bedrock or solid material at any depth to 50 ft, according to Geophysical Specialties Co.

### Gamma-Ray Logging Probe (8)

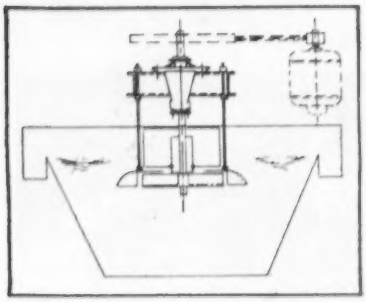
Mount Sopris Instrument Corp.'s Model SP-190 scintillation type gamma-ray well logging probe is a completely self-contained counter. Only a single conducter and ground are needed to transmit signal to surface.

### Torque Converter (9)

Production of a new, higher capacity version of the Twin Disc three-stage torque converter has been announced by Twin-Disc Clutch Co. Designated the Heavy-Duty 11,500 series, it is available in the following torque ratings; 340, 390, 450 and 540 lb ft.

# E&MJ 1957 Mining Guidebook Erratum and Addenda

## Add This Flotation Machine to the Article on pp 82-84

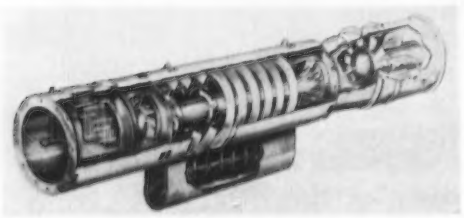


### Turbo-Mixer—General American Transportation Corp.

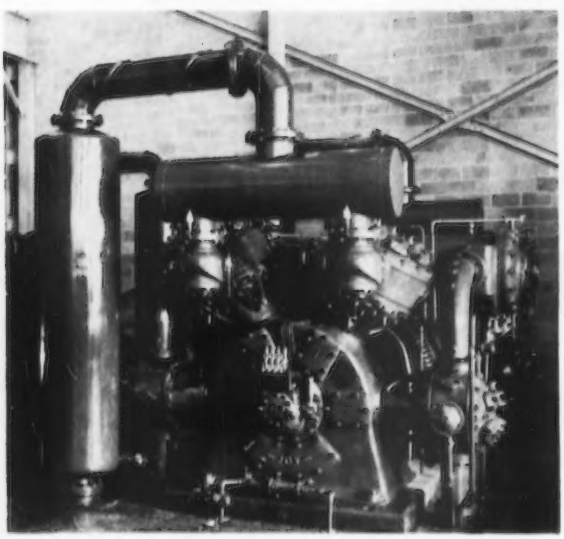
| Impeller size | Length (in.) 2-cell | 4-cell | 6-cell | Width (in.) | Height (in.) | Volume per cell cu ft | Horsepower per cell |
|---|---|---|---|---|---|---|---|
| 9 | 52 | 104 | 154 | 45 | 45 | 8 | ¾ |
| 12 | 72 | 144 | 216 | 54 | 59 | 20 | 1 |
| 18 | 96 | 192 | 288 | 87 | 72 | 57 | 2 |
| 22 | 114 | 228 | 342 | 96 | 74 | 82 | 3 |
| 27 | 132 | 264 | 396 | 102 | 80 | 120 | 5 |

## Add Joy's Microdyne to the Dust Collecting Tables on pp 100-103

| Collector types | Particle size range | Particle size and shape | Dust load | Wettability and disposability | Dust value |
|---|---|---|---|---|---|
| | All sizes | No problem | Can handle heavy load with integral precleaner | Dust must be wettable. Wet collecting and discharge | Can be used to collect valuable dust if discharge can go to process or a thickener |



| Temperature deg F | IMPINGEMENT Chemical nature | Pressure and draft losses | Efficiency | Initial cost, maintenance cost and design information | Who makes them |
|---|---|---|---|---|---|
| Can be used to 1,500 | Can handle inert or corrosive material | Low or high pressure. Some draft losses encountered —3 to 5 in. | Almost 100% above 5 microns. 80% between 2 and 5 mu | Very low first cost and installation cost. Maintenance about 5 to 7% of installed cost per year. Low water consumption. Most compact unit available | Microdyne—Joy Mfg. Co. IMPINGEMENT |



## Correction—Joy Mfg. Co. Compressor

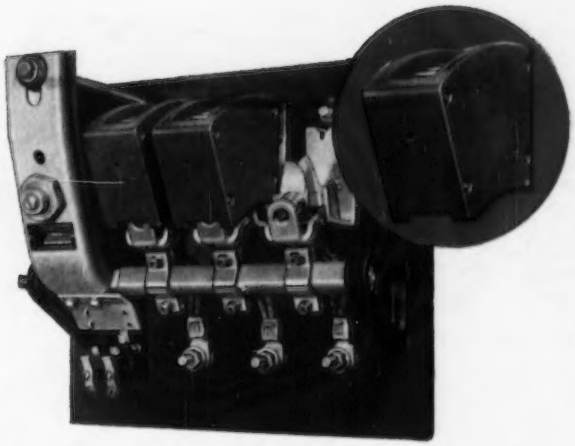
Joy WN-114 heavy-duty, four-cylinder, two-stage, double-acting, water-cooled compressor was inadvertently shown on p 61, with a caption that rated the machine with an air output much too small for this machine. Joy Mfg. Co. says that WN-114 has an output range from 1,186 to 3,896 cfm, depending on compressor size. *E&MJ* regrets the error.

## Add to the Dust Collecting Tables

| | |
|---|---|
| HIGH EFFICIENCY CYCLONE | Norblo H. E. L. S.—Northern Blower Co. |
| SPRAY TOWER | Norblo Hydraulic—Northern Blower Co. |
| UNIT FILTER | Northern Blower Co. |
| FABRIC ARRESTER | Northern Blower Co. |

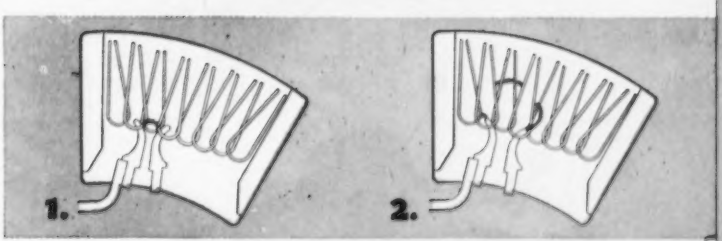
(*Continued on p. 128*)

# for fast arc interruption... without blowout coils



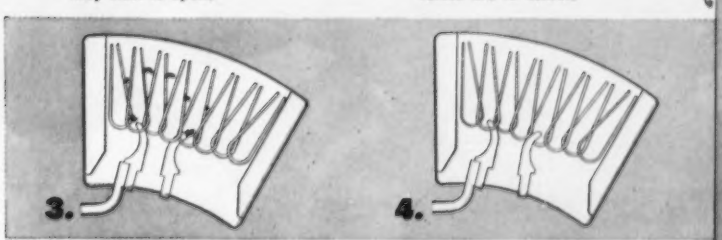
## ALLIS-CHALMERS
## TYPE 425 CONTROL
### featuring ACBO arc-centering blowout chutes for 50 to 400 hp

The advanced electrical design of Allis-Chalmers Size 4, 5 and 6 control incorporates a modern principle of arc interruption for low voltage, high horsepower applications. The *ACBO* arc chute utilizes principles of magnetic action and thermal convection to center, rupture and extinguish the arc . . . quickly. Fast arc interruption assures maximum contactor efficiency, improves performance — greatly prolongs contact and chute life.



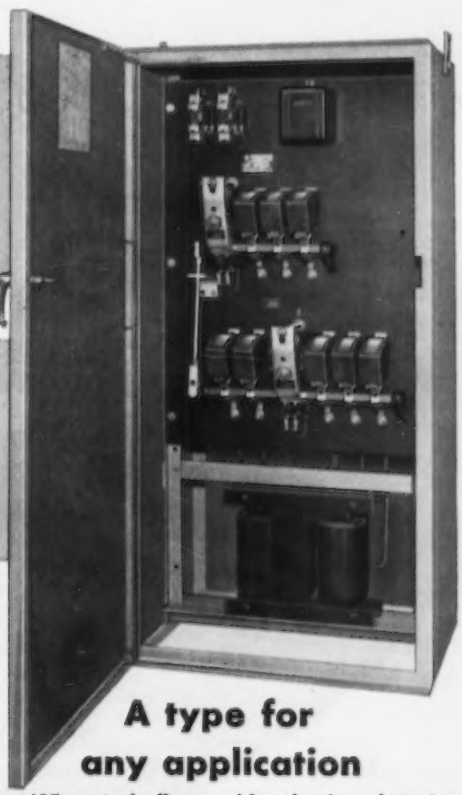

Arc across contacts as they start to open.

Strong blowout action forces arc to center.




Arc rupturing.

Contacts fully open—arc extinguished.



### Simplified mechanical design

- Streamlined clapper-type construction eliminates many parts.
- Accessibility simplifies maintenance and inspection.
- Installation is fast and easy . . . sensible enclosure dimensions provide ample wiring space.

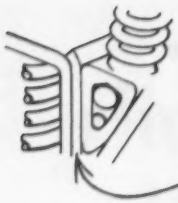
### A type for any application

Type 425 control offers a wide selection of starters and contactors for any application. For detailed information, call your A-C Control Distributor or your local A-C District Office . . . or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin. Ask for Bulletin 14B8615.

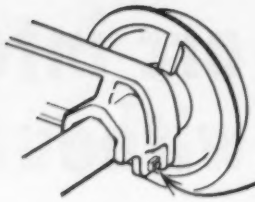
ACBO is an Allis-Chalmers trademark.

A-5343

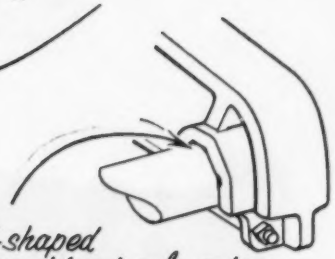
# ALLIS-CHALMERS



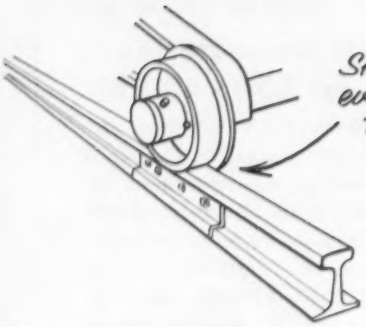
Movement between bolster and side frame is taken on specially designed wear surfaces



Quick wheel change

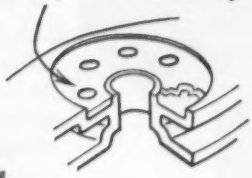


V-shaped machined axle grips for controlled flexibility and truck alignment

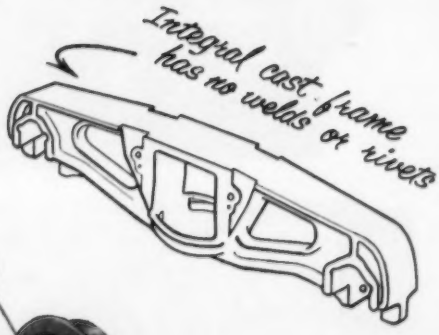


Smoother ride even on rough tracks

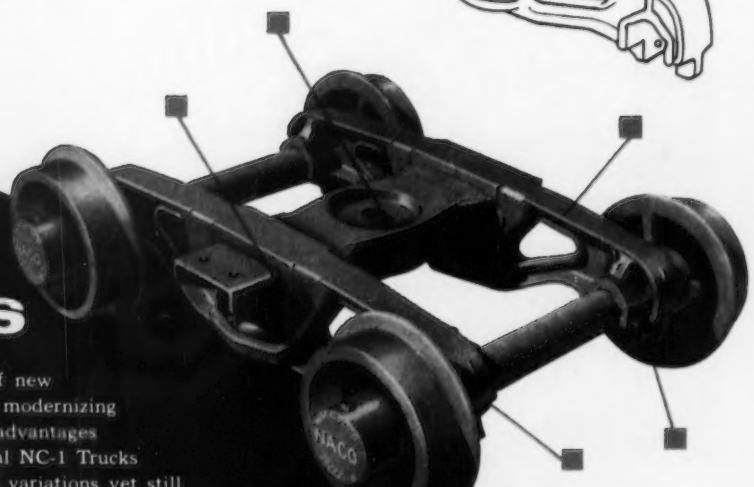
Large center bearing for longer life



Integral cast frame has no welds or rivets



# Check these "plus" features OF NATIONAL NC-1 TRUCKS




If you're considering the purchase of new 8-wheel mine cars . . . or if you're thinking of modernizing older cars—*now* is the time to check the advantages of National NC-1 Trucks. National NC-1 Trucks have controlled flexibility for track variations yet still maintain truck alignment through their machined V-shaped axle grips. In addition, NC-1 Trucks have a built-in shock absorbing mechanism.

You get more out of your mine car investment per workshift . . . per day . . . per year. And at the same time you minimize spillage . . . get greater protection for your equipment, track and structures . . . slash maintenance to a new low.

Yes, *now* is the time to check National NC-1 Trucks—they make sense for 8-wheel mine cars . . . *make dollars for operators*, too.

- WILLISON AUTOMATIC COUPLERS
- RUBBER CUSHIONED UNITS
- NC-1 CAR TRUCKS • NACO STEEL WHEELS
- NACO STEEL LINKS & SWIVEL HITCHINGS

AA-5077

## NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

*Established 1868* — *Cleveland 6, Ohio*

## What's New in Earthmoving

**Motor scraper** Model TS-160—hydraulic. Seven cu yd (struck). 155 hp. By Allis-Chalmers Mfg. **(10)**

**Rolligon Transporter**—uses low-pressure, rubber bags instead of tires. Built to travel on or off the road. Seven-ton payload by Albee Rolligon Co. **(11)**

**Removable grouser** which bolts onto the street shoes of a Case TerraTrac crawler tractor-shovel. Set of ten grousers can be attached to 1½- and 2-cu yd models. By J. I. Case Co. **(12)**

**"62" bulldozer blade**—available with cutting blade widths of 6 ft, and 7 ft 4 in. Fits John Deere 4- and 5-roller crawler tractors. **(13)**

**Eight-Wheel trucks**—with twin front and rear axles. Warner Co., Philadelphia, is using these General Motors Corp. assemblies on their concrete mixer trucks. **(14)**

**Willys Jeep bodies**—two new bodies are available. Dump or service style can be ordered to fit the new forward cab Jeeps. By Willys Motors, Inc. **(15)**

**Tractor-loader**—Oliver OC-46, with backhoe attachment, has 22-hp engine with 4-speed transmission. ⅝-cu yd bucket by Oliver Corp. **(16)**

**Crawler-tractor**—Oliver Corp.'s Model OC-18, is available with new engine-frame mounted bulldozer blade. **(17)**

**Utility tractor**—John Deere's "420" Special Utility model handles a wide variety of front and rear end working units. **(18)**

**Self-propelled crane**—Thew Shovel Co. has a 25-ton, air-operated Model SP-425 shovel crane available. Rubber tired. Four speeds in each direction. **(19)**

**Dump body**—designed for use with Heil HMT 63-102 or -117 Head-Mount Telescopic Hoist, the Heil Co. HMT-11 dump body offers rugged, light-weight construction. **(20)**

**Truck crane**—Marion Power Shovel Co.'s Marion 43-M, formerly a 35-ton machine, now has a rated capacity of 40 tons, at an operating radius of 12 ft, due to many newly added features. **(21)**

### Improving Drill Steel (23)

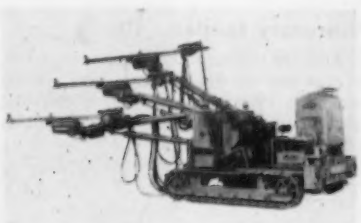
Atlas Copco Eastern, Inc. reports that their new SR treatment of drill steel protects both the outside and the flushing hole from corrosive attack. It also permits larger flushing holes to be used and enables higher drilling rates with reduced bit wear. Available on Sandvik Coromant integral drill steel, the treatment was proven at Bodas mine, Sweden. Tests on untreated steel showed that 50% of the steel failed before drilling 532 ft. The same percentage of SR-treated steel, in the same mine, had an average drilling life of 820 ft.

### Turnout Frog Repairing (24)

Morrison Metalweld Process, developed by Morrison Railway Supply Co., can restore worn-out crossings, frogs and switch points to good serviceable condition at a low cost. Call to Morrison will send a Morrison engineer to look at your track, then make recommendations on repair. Within 30 to 60 days, a mobile unit can be moved to your property to make repairs efficiently and quickly "in track under traffic."

### Loading Machine (25)

The only machine designed specifically to handle the high concentrated tonnages of the Long Piggyback Conveyor System, Model 88-C Pigloader can load at 4 to 6 tpm, tram at up to 96 fpm, according to Long Co.



### Crawler-Mounted Jumbo (26)

Available with crawlers powered by either diesel or air motors, Model JMT Mobiljumbo (R) is furnished with two or three creep-free hydraulic booms. According to Gardner-Denver Co., an air motor is used to drive the pump that operates the booms, and an air-driven electric generator supplies floodlighting power.

### Rotary Air-Drill (27)

Tractor-mounted rotary air drill announced by Davey Compressor Co. has a rated capacity of 10-in. blast holes and 35,000-lb pull down force. Drill can be mounted on Caterpillar D8 or other tractors of similiar size.

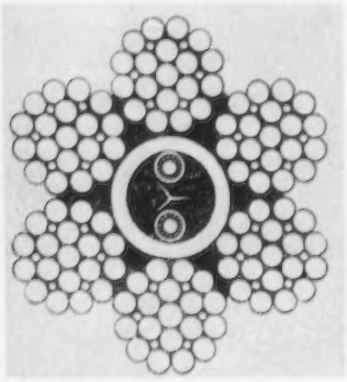
### Mucking Machine Belt (13)

New type mucking machine belt designed by B. F. Goodrich for the Poe tunnel driving project (Calif.) has carried more than 600,000 tons of rock so far. Belts were installed on four mucking machines, and carry rock at 22 deg incline to lift it 12 ft at 300-fpm. Belts have handled rocks weighing 3,000 lb.

**Continued on page 40. For more information, use card opposite page 42.**

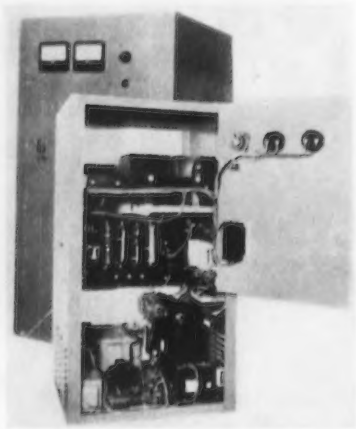
Right now, countless Bee-Zee screens are doing their job—sizing, deliquefying, drying, filtering—*making money for someone!*

Why don't *you* cash in on these famous stainless steel screens? They're precision-welded for amazingly uniform separating ...never rust or corrode...can be form-fitted to every type of equipment. Whatever your screening operation, there's a Bee-Zee screen that can make you *extra* profit dollars. For specific information about the screens you need...wire, write or phone Galesburg 4397 collect. **BIXBY-ZIMMER ENGINEERING CO.** 597 Abingdon Street, Galesburg, Illinois



### SignalKore Wire Rope (28)

This high strength and sturdy wire rope can be used to transmit communication instructions through its central core as well as transmit force for hoisting and material handling. According to Wire Rope Division, American Chain & Cable Co., Inc., SignalKore has copper conductor wire imbedded in a fiber core which is then laid up into a steel wire rope. Can be used with standard or sound-power phones.



### Automatic Battery Charger (29)

Completely automatic battery charger developed by Walker Division, Norma-Hoffmann Bearing Corp. can be used unattended and is available in 3, 6, 12, 30 and 60 ampere models.

### Diesel-Electric Well Drill (30)

Great Western Drilling Co. is drilling a 22,000-ft hole for Phillips Petroleum Co., using a diesel-electric truck-mounted rig. Electric drive was built by General Electric Co.'s Locomotive and Car Equipment department. Rig has six Cummins LRT-600 Turbodiesels with maximum rating of 450 hp at 1100 rpm. Transmission has three GE752K drilling generators which supply power to four GE752H drill motors rated at 625 hp continuously. Power pack is broken up into seven skid mounts: drawworks and motor assembly make up two loads and power the other five. Derrick was erected on the site.

### Diesel Has Exhaust Scrubber (31)

Universal 1½-ton diesel locomotive introduced by Hack Engineering Co. for underground use is equipped with a Dieseler catalytic purifier (arrow). Catalytic action oxidizes the hydrocarbons, CO and other contaminants to water and $CO_2$. Hot gases are cooled in a water-filled cooling tank.

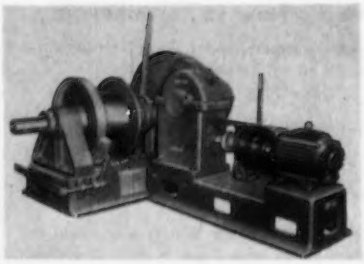
### Vibratory Feeders (43)

Eriez Manufacturing Co. is producing a new line of HI-VI electro-permanent magnetic vibratory feeders that provide greater output and have higher operating efficiencies than comparable models. Three models available. No sliding or rotating parts.

### Rubber Stopper (44)

Unique rubber stopper fits as many as seventeen different size openings, ranging from 22 to 100 mm. Called the Pluro Stopper, the product is manufactured by Bethlehem Apparatus Co., Inc.

**Continued opposite p. 42. For more information, use card opposite p. 42.**



### Two-Section Carpuller (32)

Mounted on a rigid, semi-steel base, Ehrsam Car Puller is shipped in two sections: puller and drive. Car Puller has torque converter and large drums for maximum cable life, according to J. B. Ehrsam & Sons Mfg Co.

### Auxiliary News Briefs

**Turbocharged 6-cyl engine**—International Harvester Co.'s UDT-1091 has 50 hp more than its natural aspirating counterpart, with a total of 250 hp. **(34)**

**Mechanical brake motor**—Cleveland Electric Co.'s Cle-Matic F motor has no solenoids or coils, the magnetic field of the stator releases the brake on starting and a permanent magnet applies the brake when current is shut off. **(35)**

**Aero heat exchanger**—Niagara Blower Co.'s unit consists of an arrangement of heavily finned tubes in a casing through which air is drawn by two propeller fans. Vapors or fluids to be cooled pass through the tube. **(36)**

**Electric feeder safety switch**—Ohio Brass has a 3,000-amp feeder safety switch that requires no soldering. Feeder cables are held by set screws. **(37)**

**Mine hanger tester**—simple foolproof method of testing insulated mine hangers has been developed by Ohio Brass Co. Hangers can be tested in the line or in the shop. **(38)**

**Cable fault locator**—simple, lightweight, inexpensive and easy to use, according to Ohio Brass Co. **(39)**

**Non-slip coating**—can be sprayed, brushed or rolled on to prevent falls in slippery areas says Walton-March Co. **(40)**

**Bag cutter**—save time with this convenient, simple instrument that cuts paper bags in half for easy lifting and emptying. Will cut through bagged refractories, cements and chemicals, according to Tidley & Co. **(41)**

**Bondable Teflon**—Abbott & Biddle is now surface treating Teflon sheet and tape so that it can be bonded to a variety of materials with conventional adhesives. We use rubber for its abrasive resistance, why not try Teflon which has both chemical and abrasive resistance. **(42)**

HAYNES Alloys solve the *tough* wear problems

# NO MAINTENANCE FOR 2 YEARS

## Trouble-free mining operation in abrasive muck with HAYNES Alloy

Ordinary bearings and rollers couldn't take this punishment and lasted about 3 weeks. But when these rollers were built-up and hard-faced with HAYNES STELLITE alloy No. 6, service life was extended to years instead of weeks!

Whether your equipment handles rock, sludge, or acid—where there's a serious wear or corrosion problem, you will find that a HAYNES alloy will reduce maintenance and replacement costs. For complete information about hard-facing, write for the Hard-Facing Manual. Address HAYNES STELLITE COMPANY, Division of Union Carbide Corporation, Kokomo, Indiana.

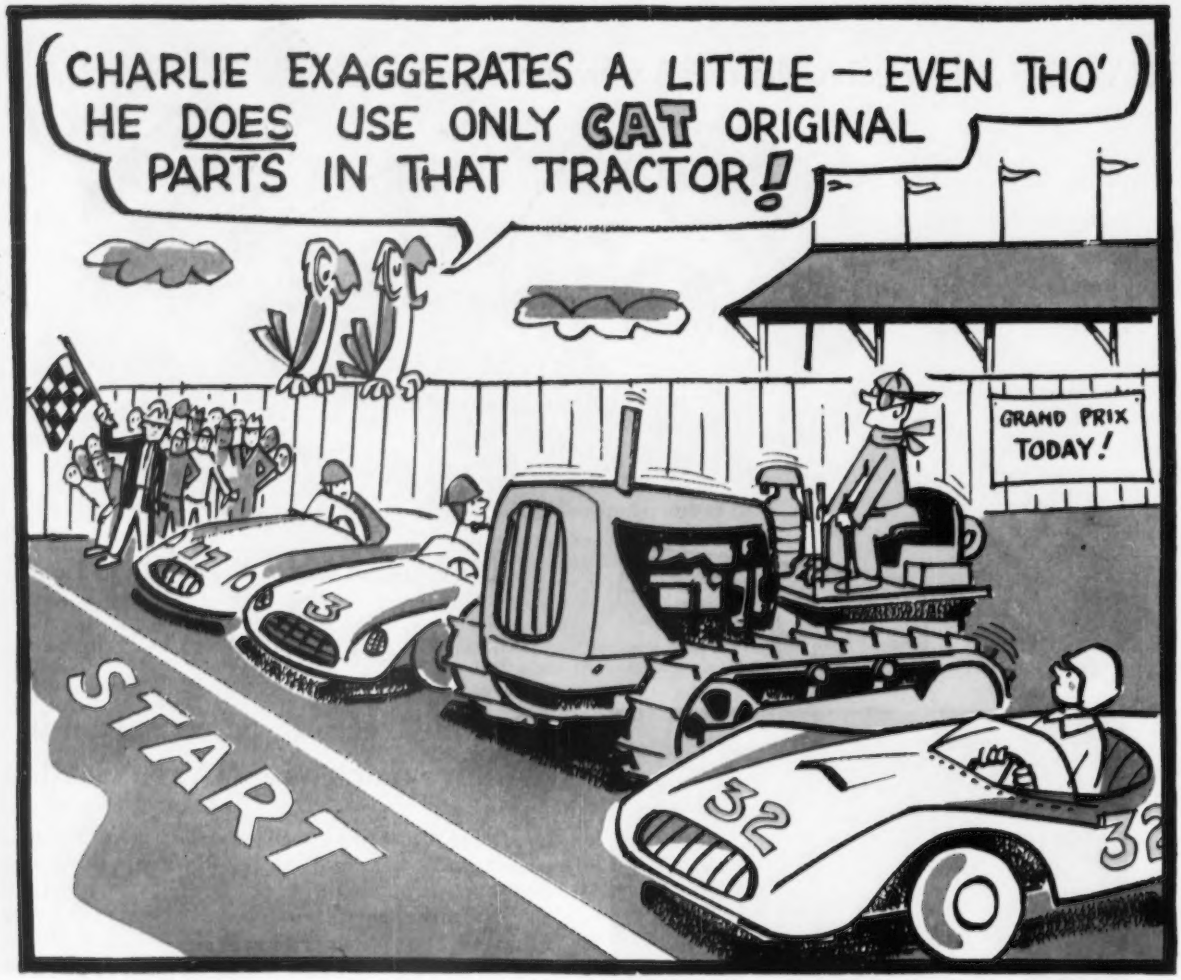
**Constantly and completely covered with abrasive muck.** This equipment, deep in the mine, gathers and transports ore at the digging sites. Parts were hard-faced right on the job—almost 600 ft. below the earth's surface—with HAYNES STELLITE alloy No. 6 rod.

*See...* or *Write...*

**Your local Haynes Stellite Dealer**

**to Haynes Stellite Company**

"Haynes," "Haynes Stellite" and "Union Carbide" are registered trade-marks of Union Carbide Corporation.



Are they really as much alike as they look? Steel used in industrial standard bolts must withstand 120,000 pounds pull per square inch—CAT* bolts must withstand *at least* 151,000 PSI. Same with other Cat original track parts—higher standards. With "look-alike" track parts, who knows? Be sure to get parts you can trust—from your Caterpillar Dealer. He always has *exactly* the part you need. Call on him anytime.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

**CATERPILLAR***

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

E&MJ NEW PRODUCTS DIGEST (*Continued*)

E&MJ NEW PRODUCTS DIGEST (*Continued*)

**For More Details on New Product Items and For Copies of Free Literature Listed Below — Circle the Proper Number on Card. Be Sure to Give Your Name and Address.**

# For Your Files

**This selected manufacturers' literature is free unless otherwise specified. If item is for sale, send request and money direct to manufacturer.**

### EXPLORATION AND MINING

**SEISMIC MAGNETIC AUTOMATIC COMPUTER**—"seisMAC", the only all electronic seismic data processing computer on the market, according to Texas Instruments Inc., and its related equipment for central office processing, are described in a 8-page brochure. **(50)**

**BLASTING ELECTRICALLY** provides essential information on the firing of explosive charges by electricity. Contents cover priming procedures and basic principles involving types of circuits, wiring-up operations and firing. 61 pp. Available from Canadian Industries Ltd. **(51)**

**LOWBOWL SCRAPERS KEEP COSTS LOW** is the title of Caterpillar Tractor Co.'s latest 8-page bulletin. **(52)**

**ROCK RIPPERS** designed to work on International Harvester TD-14, 18 and 24 tractors are described in Greenville Steel Car Co.'s 4-page brochure. **(53)**

**TRACTOLOADER LINE** of five 4-wheel and 2-wheel models of front-end loaders are described in Tractomotive Corp.'s 16-page catalog. **(54)**

**HD-21 CRAWLER TRACTOR** specification sheet is 4 pages, and is available from Allis-Chalmers Manufacturing Co. **(55)**

**REPRESENTATIVE OWNERS OF CATERPILLER V-8 and V-12 DIESELS,** booklet just released by Caterpillar Tractor Co., tells where, who and by whom the engines are used. Illustrated in 12 pp. **(56)**

**HD - 16 DIESEL POWERED CRAWLER TRACTOR** is described in Allis-Chalmers Manufacturing Co.'s 6-page release. **(57)**

**MINING TOOL CATALOG** prepared by Metallurgical Products Department, General Electric Co., details the company's complete line of Carboloy carbide coal mining machine, roof, auger and finger bits, as well as specifications and information on carbide tools for related mining applications. **(58)**

**PUMPS FOR DIAMOND DRILLING** is the title of a 4-page bulletin prepared by E. J. Longyear Co. Release deals with the transmission and single speed pumping units used in diamond drilling. Material explains drilling practice and outlines the advantages of transmission pumps for most core drilling operations. **(59)**

### AUXILIARY EQUIPMENT

**TIME SAVING TIPS** for the Draftsman and the Engineer, is the title of a 36-page booklet released by Frederick Post Co. showing 59 shortcuts to speed drafting and computation work. Very good. **(60)**

**MECOSTITCH** is the technique of repairing fractures by cold upsetting of high strength alloy. Mecostitch sutures across the joint on large castings where welding cannot be tolerated. Described in Maintenance Engineering Corp.'s bulletin. **(61)**

**CONVERSION CHART FOR HARDNESS VALUES** is desk-size, contains conversion data for Rockwell tests and other hardness scales and is available from Torsion Balance Co. **(62)**

**USE OF STEEL CASTINGS IN THE MINING INDUSTRY** is the title of a 21-page booklet prepared by Eimco Corp. **(63)**

**COLUMBIUM AND TANTALUM PRODUCTS** are covered in Shieldalloy Corp.'s two-color 4-page bulletin. **(64)**

**LOCTITE SEALANT,** the liquid plastic for locking threaded fasteners, is described in detail in a 12-page bulletin prepared by American Sealants Co. **(65)**

**SIX - CYLINDER CARBURETED POWER SUPPLY UNITS** that operate on gasoline, liquid petroleum gas or natural gas are described with tables, charts and cutaways in International Harvester Co.'s Catalog CR-511-G. 12 pp. **(66)**

**SEPT. 1957**

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| 4 | 18 | 32 | 46 | 60 | 74 | 88 |
| 5 | 19 | 33 | 47 | 61 | 75 | 89 |
| 6 | 20 | 34 | 48 | 62 | 76 | 90 |
| 7 | 21 | 35 | 49 | 63 | 77 | 91 |
| 8 | 22 | 36 | 50 | 64 | 78 | 92 |
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| 14 | 28 | 42 | 56 | 70 | 84 | 98 |

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## E&MJ NEW PRODUCTS DIGEST (*Continued*)

**AXIVANE FANS,** Series 1,000, are thoroughly described in Joy Manufacturing Co.'s 14-page catalog that shows typical motor, fan and duct installations, specifications and the advantages of vaneaxial design over centrifugal and propeller-type fans. **(67)**

**GEARMOTORS AND PACKAGED DRIVES,** AGMA classes I, II and III, 7.5 to 780 rpm, are covered in descriptive bulletin 3650 prepared by Gearing Division, Westinghouse Electric Corp. Selection data for horizontal, vertical, right angle and packaged drives, plus construction details and specifications are included in 8 pages. **(68)**

**MECHANICAL CLEANER FOR COMPRESSED GAS AND AIR LINES** is thoroughly described in Aridifier Division, Logan Engineering Co.'s 8-page release. Aridifier will remove 92% of all moisture, oil, dirt and fine scale in the line. **(69)**

**ELECTRIC CHAIN HOIST** design, construction and dimensions are detailed in Wright Hoist Division, American Chain & Cable Co., Inc.'s 4-page bulletin. **(70)**

**BRASS VALVES,** with quick-change disk, for simple, low-cost standardization and maintenance, according to Crane Co., are described in 4-page mailer. **(71)**

**ALUMINIZED PLASTIC COVER PLATE** for welding helmets and a new aluminized cellulose acetate face shield window, for protection against radiant heat are displayed in American Optical Co.'s brochure C-6310. **(72)**

**THERMOSTATIC STEAM TRAPS** with freeze-proof guarantee are the subject of V. D. Anderson Co.'s 4-page bulletin No. 257. **(73)**

**SPRING-LOADED RELIEF AND BACK PRESSURE VALVES** from Atlas Valve Co. are presented in a one-page catalog sheet. **(74)**

**KARBATE** impervious graphite entrainment separators, Type MV, are exhibited in National Carbon Co.'s 4-page brochure. **(75)**

**PRESSURE-VACUUM CONTROL,** Type H274, has two separate switch actions, permitting control of two separate circuits, and is available in eight models in a variety of adjustable ranges from 0 to 180 psi, according to literature available from United Electric Controls Co. **(76)**

### MILL AND SMELTER

**MERCO A-24 CONTINUOUS CENTRIFUGAL SEPARATOR** for continuous concentration or classification of bulky suspended solids is described in cutaway and text in 4-page bulletin No. 3053 from Dorr-Oliver Inc. **(77)**

**DENVER EQUIPMENT** for chemical processing, mining and milling industries is described in bulletin No. G3-B60 from Denver Equipment Co. 8 pp. **(78)**

**PINCH VALVES,** rubber or Neoprene, for corrosion and abrasion resistance, for pulps or liquids, in the Massco-Grigsby line are described in Mine & Smelter Supply Co.'s 10-page catalog bulletin. **(79)**

**HIGH TENSION SEPARATOR** for laboratory or pilot plant use has been developed by Carpco Manufacturing, Inc., and is described in 2-page flyer. **(80)**

**STAINLESS STEEL LIQUID METER,** using Neptune's trouble-free, reliable nutating-disk metering principle, is shown in Neptune Meter Co.'s 4-page bulletin along with a list of liquids that can be measured through the meter. **(81)**

**STEAM TUBE DRYERS** in the Louisville line of General American Transportation Corp. may be examined through the 17-page bulletin No. 53 prepared by the company. Many mineral compounds are being dried in steam tube units. Might be of interest to those doing solvent extraction work. **(82)**

**TRIPLE ROLL CRUSHER** by McLanahan & Stone Corp. is described in 4-page bulletin. Unit is designed to reduce run-of-mine coal to fine sizes in a single unit. **(83)**

**FLOCCULANT,** Burtonite V-8-F is described in Burtonite Co.'s technical data sheets. Burtonites are highly polymerized saccharide complexes of mannose and galactose sugars. **(84)**

**BECKMAN ELECTRODES** for pH meters are covered in an 8-page bulletin No. 86L, now available from Beckman Instruments, Inc. **(85)**

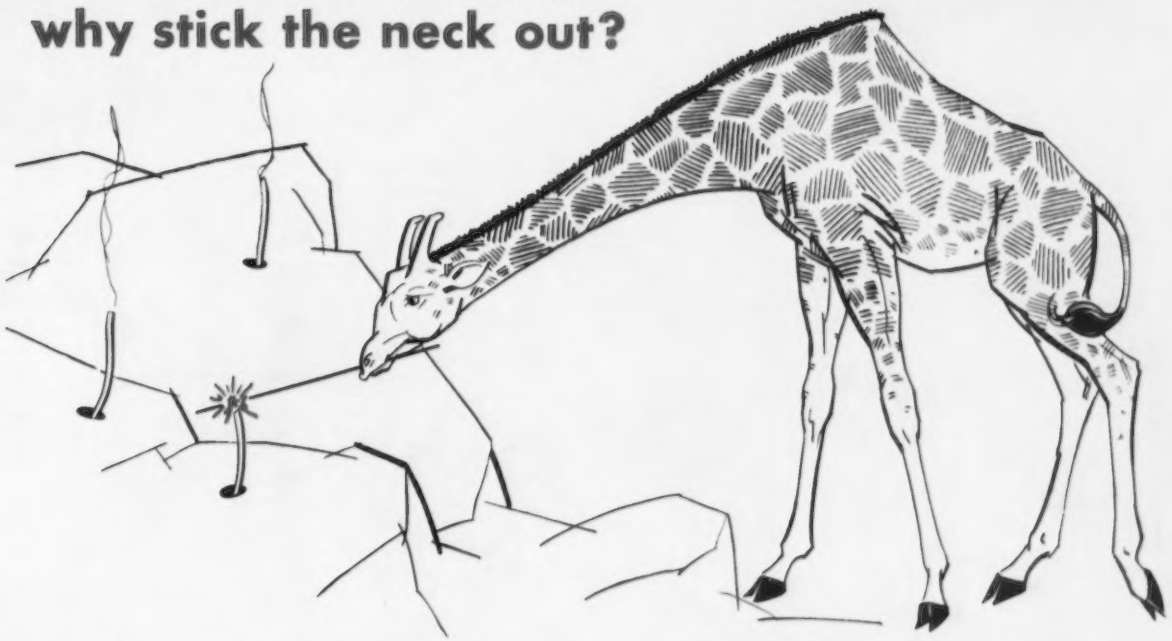
**BECKMAN METERS** for pH measurements are described in four single-page bulletins. Beckman Instruments, Inc. makes laboratory, plant and pocket pH meters. **(86)**

**TWENTY-SEVENTH ANNUAL ADDITION, THE FLOTATION INDEX FOR THE YEAR 1956** is now available from Dow Chemical Co. Index is 15 pp. and lists many published articles on flotation research, mineral dressing, heavy-media separation and milling operations. **(87)**

**CONVEYOFLO METER** for continuously weighing and controlling belt-conveyed materials is detailed in 4-page release from Builders-Providence, Inc. bulletin No. 550-P5. **(88)**

**WATER SPRAY NOZZLES** in the Concenco line are presented in illustrated folder that gives installation notes and charts on how to choose the proper size. From Deister Concentrator Co. **(89)**

# In Secondary Blasting, why stick the neck out?



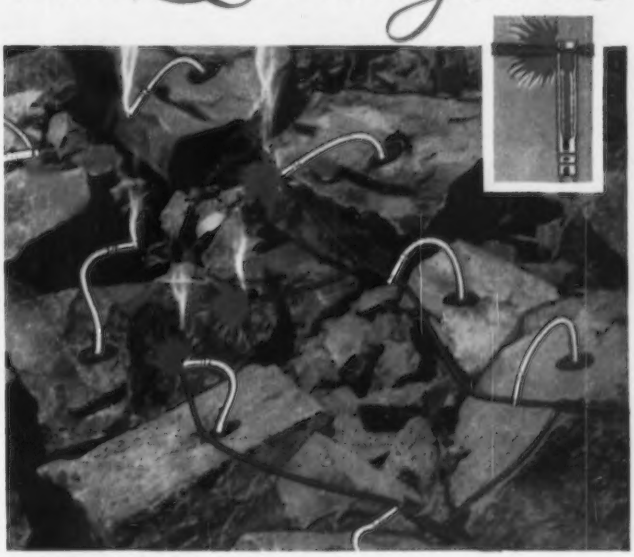
## One-shot lighting is safer and easier . . . with *Quarrycord*

**SAFER** — because you can use safety fuse with no danger from stray electrical currents from equipment or thunderstorms.

— because you fire all shots from a remote point. The men are not on the rock pile lighting each fuse individually.

— because your secondary blast will go off in a series of small shots — "pop-pop-pop" instead of "boom!"

**EASIER,** too — because you can cut your safety fuse to the minimum length prescribed by your State law and prepare your fuse primers with caps and connectors, ready to load any hole. You connect the holes with Quarrycord, covering the rock pile with a network of trunk lines and cross connections that can carry the fire to every safety fuse in plenty of time before the first hole "goes."



*It's quite a story, told completely in this folder which we'll send you, free, when you ask for it. Write today.*

Your explosives supplier can supply Quarrycord and Connectors. Q-2

**THE ENSIGN-BICKFORD COMPANY**

**Simsbury, Connecticut • Since 1836**

*Primacord® Detonating Fuse, Safety Fuse, Ignitacord®, Quarrycord, Pyrotechnical Devices and Blasting Accessories*

A Bucyrus-Erie 150-B shovel strips wasterock and dirt in a copper pit in western United States. Two more Bucyrus-Erie electric excavators and a Bucyrus-Erie rotary drill are in the background.

# WHEN IT'S HIGH OUTPUT YOU WANT IT'S BUCYRUS-ERIE YOU NEED

Many copper mines are helping protect their profit margins with Bucyrus-Erie Ward Leonard electric shovels. Sustained high output is essential to economical production . . . and consistently high production is yours with these Bucyrus-Eries.

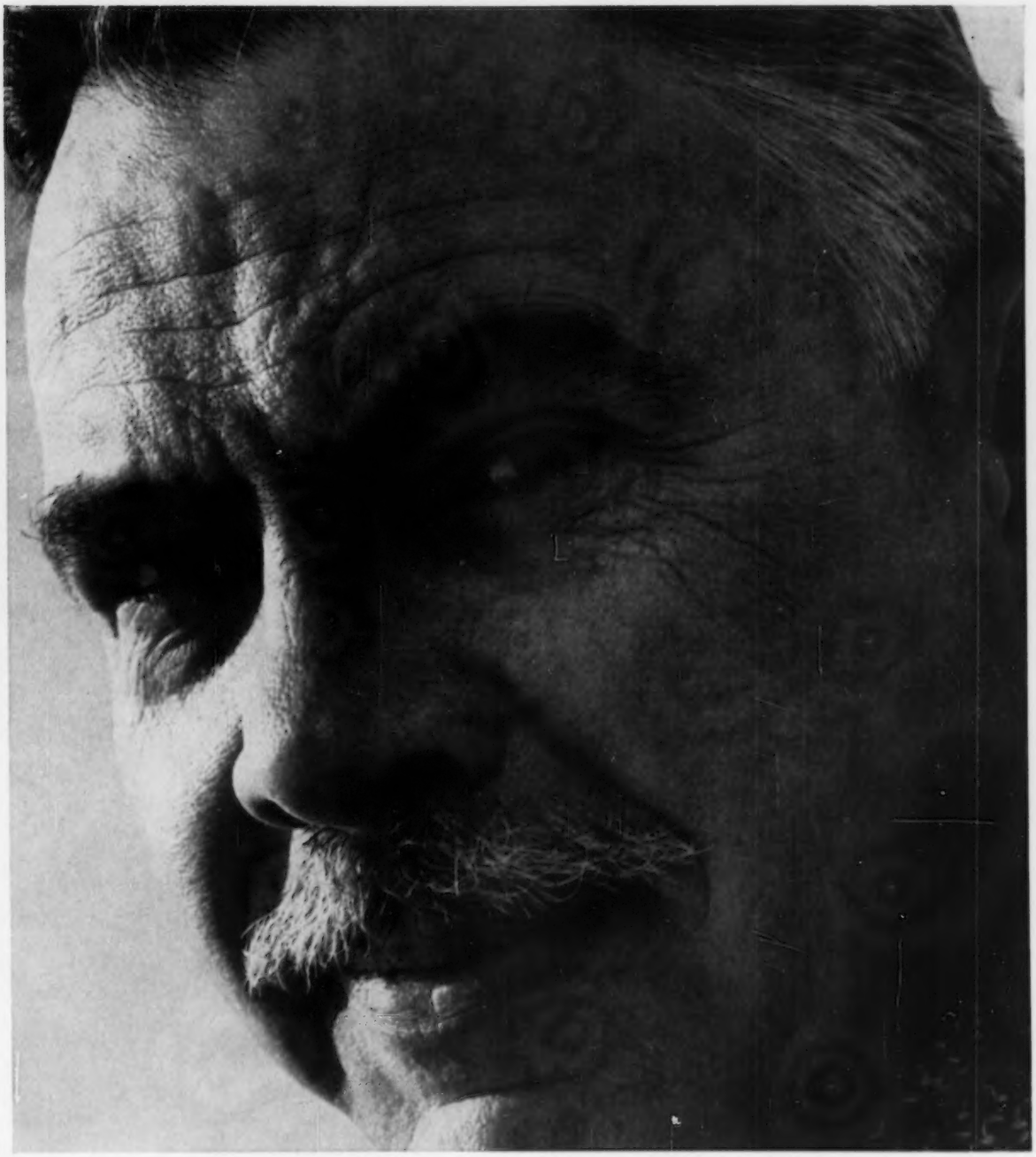
Check their design and construction advantages and you'll see why they are known as top producers in mines everywhere. Outstanding front-end design keeps a high percentage of "up-front" weight *inside* the dipper where it pays. The two-piece boom is strong yet light in weight. Crowd machinery is mounted on the revolving frame, not on the boom. Result: power swings payload, not deadweight.

When selecting stripping and loading shovels, if you consider output, cost, and long life, you will want to consider these three great Bucyrus-Erie Ward Leonard electric excavators.

128L57C

BUCYRUS ERIE *A Familiar Sign at Scenes of Progress*

BUCYRUS-ERIE COMPANY • SOUTH MILWAUKEE, WISCONSIN



## When your process calls for chemicals talk to the man from Dow

YOU CAN DEPEND ON DOW FOR: XANTHATES • DOWFROTH® 250 • Z®-200 • SEPARAN 2610® • HYDROCHLORIC ACID • AMMONIA • CHLORINE CAUSTIC SODA • VERSENE® • MAGNESIUM OXIDE • MAGNESIUM HYDROXIDE • ION EXCHANGE RESINS • SOLVENT EXTRACTANTS

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

DOW

*New Mexico: close-up of uranium filtering operation at Blue Water Plant of The Anaconda Company.*

# On these filters Separan 2610 more than doubled mill throughput

*Another production problem solved with the new high-speed flocculant, Separan 2610*

Previous to using Separan 2610® as a flocculant, this southwestern uranium processor undertook what seemed to be an impossible task. He wanted to double tonnage throughput without adding filtering or thickening equipment.

This processor tried the "old stand-by" flocculants, but could get neither the desired flocculation speed nor thick enough filter cakes that would discharge easily. To accomplish his goal seemed impossible . . . until he talked to the man from Dow and applied the new and different flocculant, Separan 2610.

**Here are the results:**

| Ore | Before Tons/Day | After Tons/Day |
|---|---|---|
| Very slimy | 50 | 400...at 1.0# Separan/T |
| Blended | 200 | 450...at 0.6# Separan/T |
| Blended | 250 | 500...at 0.5# Separan/T |
| Good limestone | 350 | 500...at 0.15# Separan/T |

You'll notice that with Separan 2610, average filtering rate of the various ore compositions *more than doubled!* This is no phenomenon. Separan 2610 has proved itself with practically every mineral mined. In several mills, it has even tripled production rates!

**Easy to prepare and apply**

Being a synthetic organic polymer, every order of Separan 2610 provides the same uniform quality. It adds no excess bulk, is effective in both acid and alkaline circuits. Stock solution requires no heat or preservative; a disperser enables you to prepare large amounts without a mechanical mixer.

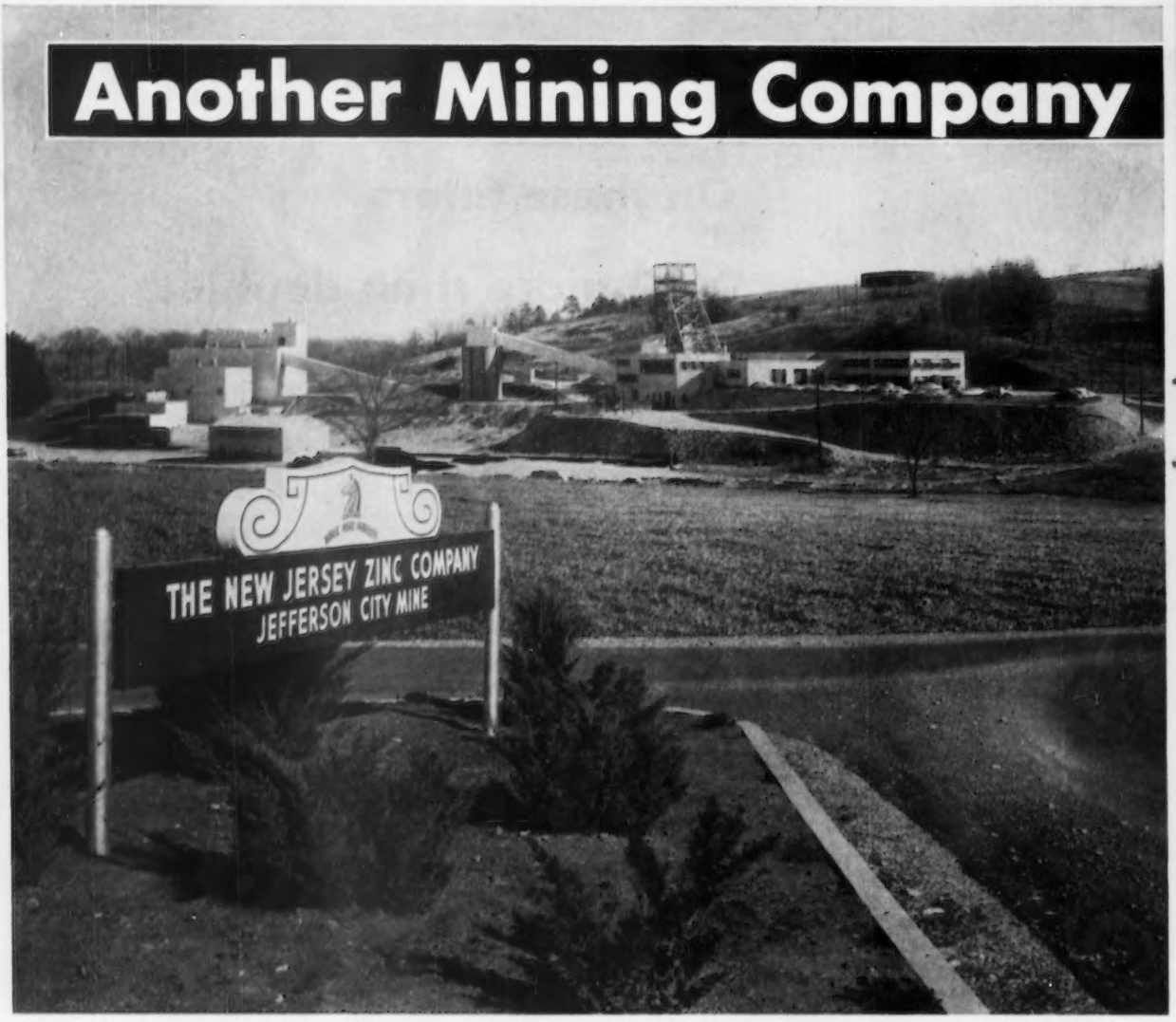
For faster settling, improved filtration, reduced loss in overflow—try this revolutionary flocculant yourself. Available from three f.o.b. points: Midland, Michigan; Pittsburg, California; and Velasco, Texas . . . and from two stock points: Port Newark, New Jersey, and St. Louis, Missouri. Samples, technical assistance and results more specifically related to your type ore can be obtained through your Dow man. Or write us direct. THE DOW CHEMICAL COMPANY, TECHNICAL SERVICE AND DEVELOPMENT, Midland, Michigan, Dept. SE 1316A-1.

*When your process calls for chemicals, talk to the man from Dow*

XANTHATES • DOWFROTH® 250 • Z®-200 • SEPARAN 2610® • HYDROCHLORIC ACID
AMMONIA • CHLORINE • CAUSTIC SODA • VERSENE® • MAGNESIUM OXIDE
MAGNESIUM HYDROXIDE • ION EXCHANGE RESINS AND SOLVENT EXTRACTANTS

YOU CAN DEPEND ON DOW

# Another Mining Company




This is a new important mining operation that is taking advantage of the cost saving benefits made possible by the Gismo Self-Loading Transport. The Jefferson City Mine of The New Jersey Zinc Company is an example of the result that can be obtained by careful planning, design and selection of equipment.

This Gismo machine makes it possible for you to devise and organize a simple mining method. We believe the lowest cost possible is obtained when your plan provides for the fewest pieces of equipment, supplies and men. The Gismo is simple, versatile — mucks in development or production, can drill as a jumbo, make its own roadways, etc. It can transfer its load direct to cars by means of ramp cars . . . or direct to cars or trucks by means of ramping-over (see circled photo at right) . . . or direct to surge pocket for transfer to a common haulage system or method.

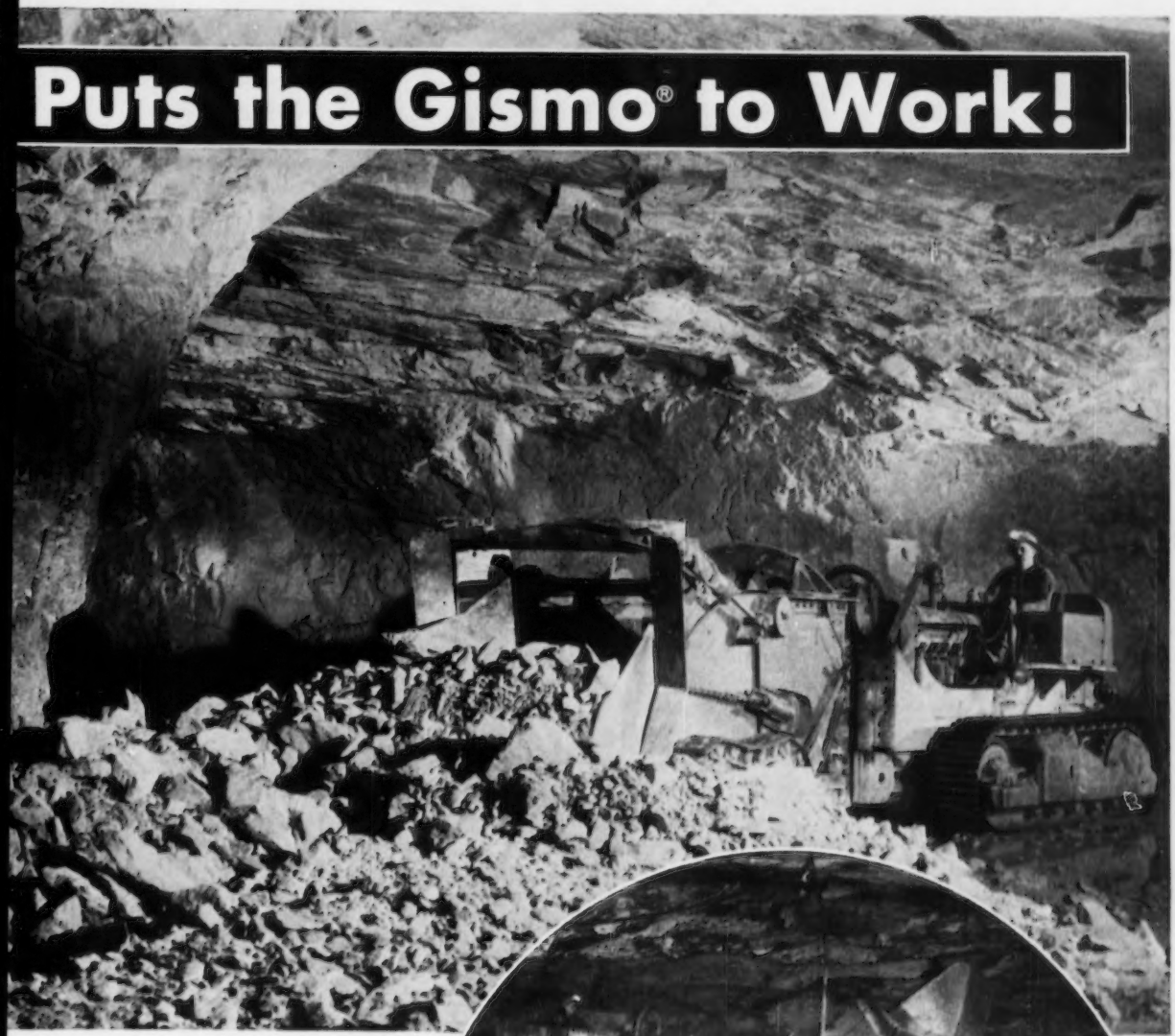
Investigate the extraordinary economies that have been obtained with the use of this remarkable machine. Its principle provides you with a new fundamental opportunity to devise ways and means of cutting costs that you have not had for many years. Write us today. Sanford-Day Iron Works, Inc., Knoxville, Tenn.

**SANFORD-DAY**

KNOXVILLE, TENNESSEE

**SUPER MARKET FOR MINE CARS — all types . . . PRECISION WHEELS . . . BROWNIE HOISTS . . . GISMO SELF-LOADING TRANSPORT that loads in development or production . . . transports . . . supports 2 to 5 jib mounted drills . . . back fills . . . moves boulder rocks . . . makes its own roadways and cleans up completely — a new method of hard rock mining offering a tremendous reduction in cost per ton!**

# Puts the Gismo® to Work!



**THE NEW JERSEY ZINC COMPANY'S Jefferson City Mine incorporates the latest and most modern equipment, including the Gismo, S-D Ore Cars and S-D "Brownie" Hoist. Above you see the Gismo mucking out a load. Circled photo at right shows the ramp-over-cars' transfer point. One man, the Gismo operator, handles the entire operation by means of push-button control of the S-D "Brownie" Hoist. Operator's control lever is located just below roof above the ramp. The S-D "Brownie" Hoist automatically moves trip when another empty car is positioned under ramp. Operating arm located beside cars "tells" hoist when to stop the trip. The S-D Ore Cars haul production to ore pass.**

# Going down...

# down...

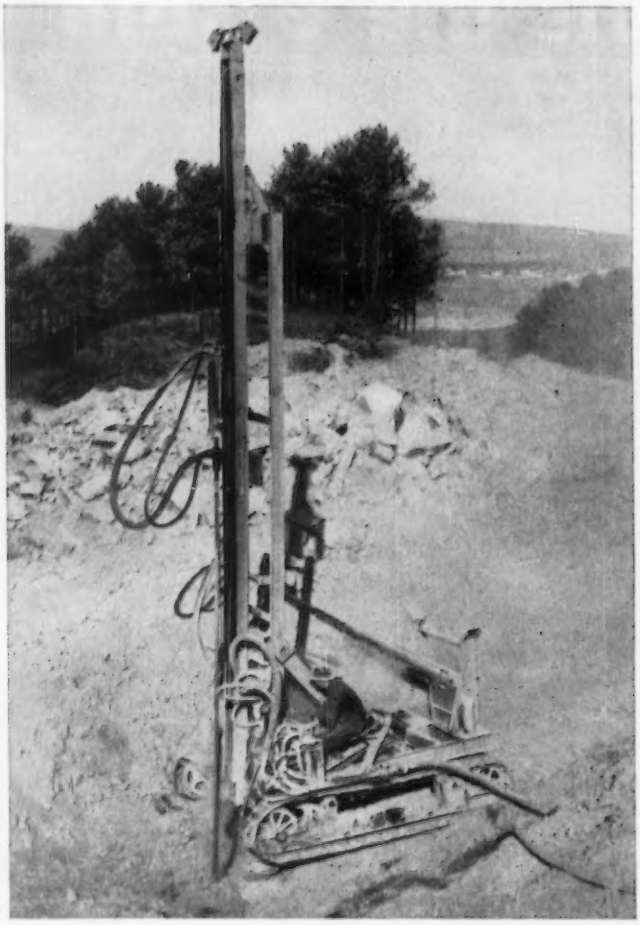
# down...

# with a

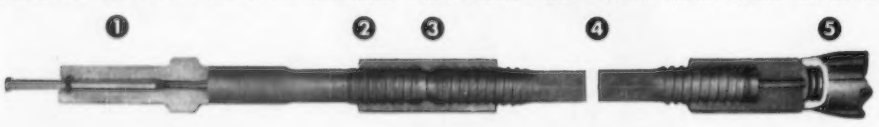
# Gardner-Denver

# DH143

Don't settle for halfway measures when you want rock drilling depth. Move in and drill deep holes fast with the Gardner-Denver DH143. This hard-hitting rock drill has a 5½" hammer diameter . . . handles rod changes to 20' . . . delivers the heavy-duty, deep-hole punch needed in pits, quarries and open cuts. It allows you to select the proper bit and plan the proper spacing for the best breakage in any ground.



**GARDNER-DENVER SECTIONAL DRILL ROD EQUIPMENT WITH RING SEAL SHANKS**




Use Gardner-Denver ring seal shanks and sectional drill rods with the DH143. They are made like the highest quality rock drill parts. Special steels combined with the finest metallurgical techniques—shot peened and carburized—give this drill steel lasting deep hole drilling durability.

1. **Ring Seal Shank**—trouble-free, long-wearing "O"-ring seal.
2. **Threads**—specially long for greater durability.
3. **Couplings**—designed and developed for the job.
4. **Rods**—specially treated like the finest quality rock drill parts.
5. **Carbide Bit**—holds gauge on deepest holes.

ENGINEERING FORESIGHT—PROVED ON THE JOB
IN GENERAL INDUSTRY, CONSTRUCTION, PETROLEUM AND MINING

## GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois

EXPORT DIVISION, 233 Broadway, New York 7, New York
In Canada: Gardner-Denver (Canada), Ltd., 14 Curity Ave., Toronto 16, Ontario

CYANAMID

# REAGENT NEWS

*"ore-dressing ideas you can use"*

## *Versatile AEROFLOC® Reagents speed settling and filtration economically in a wide range of applications!*

Wherever it is desirable to consolidate finely-divided particles in aqueous suspension, you will find AEROFLOC Reagents effective and economical.

These synthetic polymers flocculate concentrates and tailings for more rapid settling and improve filtration rates. They increase washability and aid the discharge of filter cakes, lower loss of soluble metal values, increase liquid recovery and prevent the blinding of filter cloths. They will lower solids content in plant effluents helping to prevent pollution.

Flocculating action of these is practically instantaneous, with only brief mixing needed for thorough dispersion. Extremely low concentrations are completely effective.

For samples of AEROFLOC Reagents and information on laboratory test methods, handling and feeding, contact your Cyanamid Field Engineer.

*Background is a photo micrograph magnified x 75 of mineral slimes flocculated with AEROFLOC reagent.*

**AMERICAN CYANAMID COMPANY**
**MINING CHEMICALS DEPARTMENT**
**30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.**

**NORTH AMERICAN CYANAMID LIMITED**
*160 Bloor Street East, Toronto 1, Ontario, Canada*

**CYANAMID DE MEXICO, S. A.**
*Apartado No. 26012, Mexico 12, D. F., Mexico*

**CYANAMID OF GREAT BRITAIN LTD.**
*Bush House, Aldwych, London W. C. 2, England*

**SOUTH AFRICAN CYANAMID (PTY.) LTD.**
*P. O. Box 7552, Johannesburg, Union of South Africa*

**E. P. CADWELL**
*Belen 1048, Of. 6, Lima, Peru*

**G. B. O'MALLEY**
*377 Little Collins St., Melbourne C. 1, Australia*

*Cable Address—Limenitro, New York*

# STANDARD on the big-yardage projects . . .

## Bucyrus-Erie walking draglines

Producers everywhere have learned from long experience that Bucyrus-Erie walking draglines set the standard for dependable, low-cost handling of multi-million-yard mining operations.

The unit shown above, owned by Davison Chemical Co., Division of W. R. Grace and Co., Bartow, Fla., is one of many Bucyrus-Erie walking draglines working in Florida phosphate fields. They set the standard there for dependability, with simple, proved design and strong construction throughout. They set the standard for big output and economy with exclusive Bucyrus-Erie walking mechanism that makes move-ups smooth and accurate . . . with strong front end that reduces deadweight, permits applying maximum power to swinging payloads . . . and with Ward Leonard variable-voltage control that provides faster acceleration and deceleration than is possible with any other type of control.

If your operations require handling big yardages, let us tell you more about the proved dependability and economy built into Bucyrus-Erie walking draglines—¼ to 3¼-cu. yd. capacities.

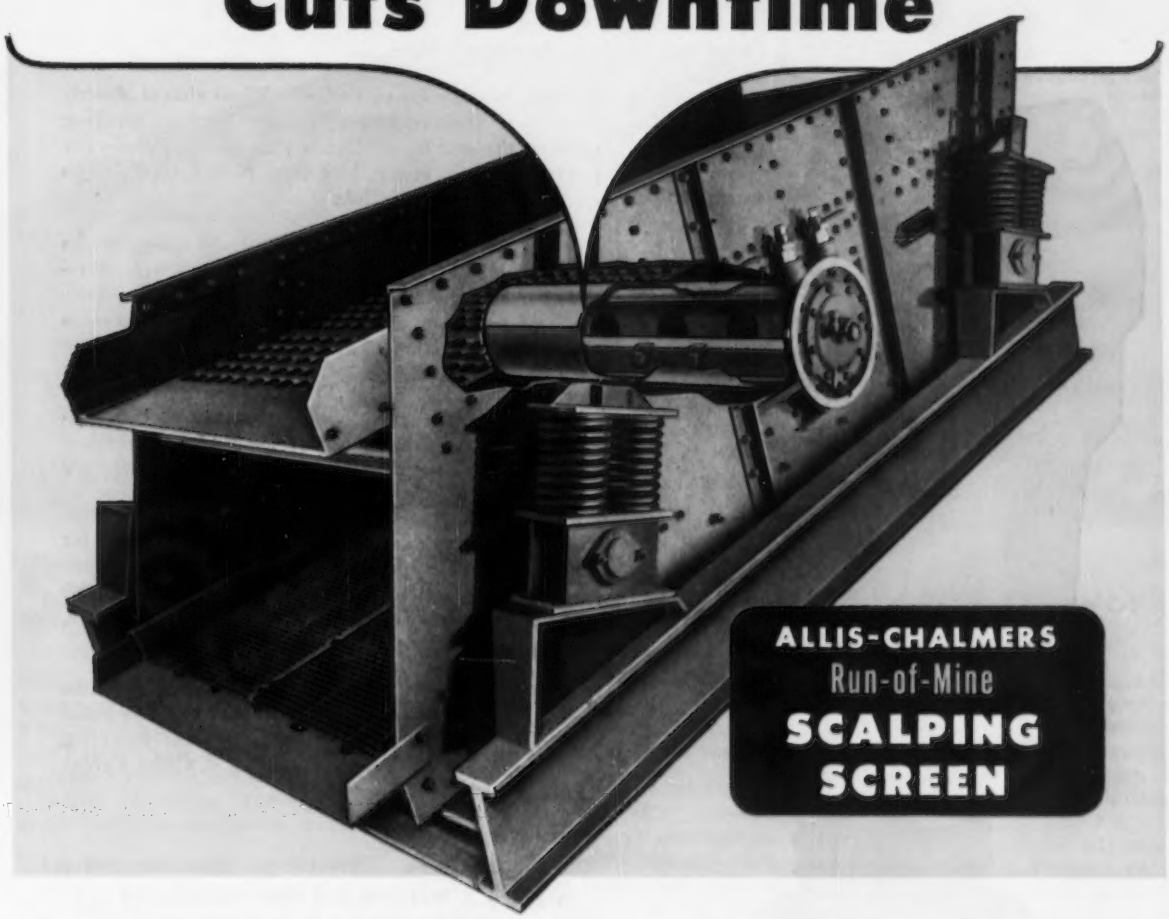
145L57

**BUCYRUS-ERIE COMPANY** • South Milwaukee, Wisconsin

BUCYRUS ERIE

*For drifters, airhogs and stopers*

# Replaceable Cartridge Mechanism Cuts Downtime




CHANGING this screen mechanism is as simple as changing a battery in your car. All you do is remove four bolts and slide out the entire mechanism.

The cartridge mechanism gives you the added advantage of taking it to your maintenance bay or shop where all facilities are handy and maintenance costs are lowest.

If your process involves a multiple installation, it is highly profitable to keep a replacement mechanism in reserve. Slip one out, slide another in. Keeping production flowing is as easy as that.

### Other Maintenance-Reducing Features

The proven simplicity and record-low maintenance of two-bearing design . . . largest, most sturdy bearings ever installed on a vibrating screen . . . multiple (two sets per corner) steel support springs that prevent transfer of vibration to structure even when materials stick to screen . . . sealed-in mechanism with single grease seal on drive side that eliminates multiple possibilities of dirt infiltration — all these features keep maintenance cost low.

*For complete information, see your nearby Allis-Chalmers representative or write for Bulletin 07B8368. Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wis.*

A-5194

**ALLIS-CHALMERS**

*For drifters, sinkers and stopers . . .*

# New TIMKEN® threaded carbide bit

## Has 5 new features to lower your cost per foot-of-hole

**5 front holes** clear chips faster. Water shoots directly forward with more velocity against the face, washing chips to the rear faster. Center plug is dropped deeper for freer cutting action, less drag. New frontal design *cuts your cost per foot-of-hole.*

**Deeper, wider clearance** between the wings works with five front holes to speed chip removal. Extra clearance permits water to carry chips away faster from the cutting face. Faster chip flow speeds drilling, increases efficiency. You get *lower cost per foot-of-hole.*

**Deeper undercut** under the heel provides even freer passage for washed-back chips. It reduces bit drag, increases bit life. This new feature, plus redesigned heavier wing, helps speed your drilling, *lowers your cost per foot-of-hole.*

**Wear-resistant carbides** give the new Timken® bit longer life. These special analysis carbides resist wear better, provide added shock-resistance. They can be reconditioned many times. Bit gives longer service life, you get *lower cost per foot-of-hole.*

**Improved thread contact** reduces breakage. You get longer bit life, *lower cost per foot-of-hole.* Write today for free brochure. The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable: "TIMROSCO".

### THERE'S A TIMKEN BIT FOR EVERY JOB . . . EVERY DRILLING CONDITION

**TIMKEN MULTI-USE BIT**

With correct, controlled reconditioning, gives lowest cost per foot-of-hole when full increments of steel are used.

**NEW TIMKEN TAPERED SOCKET BIT**

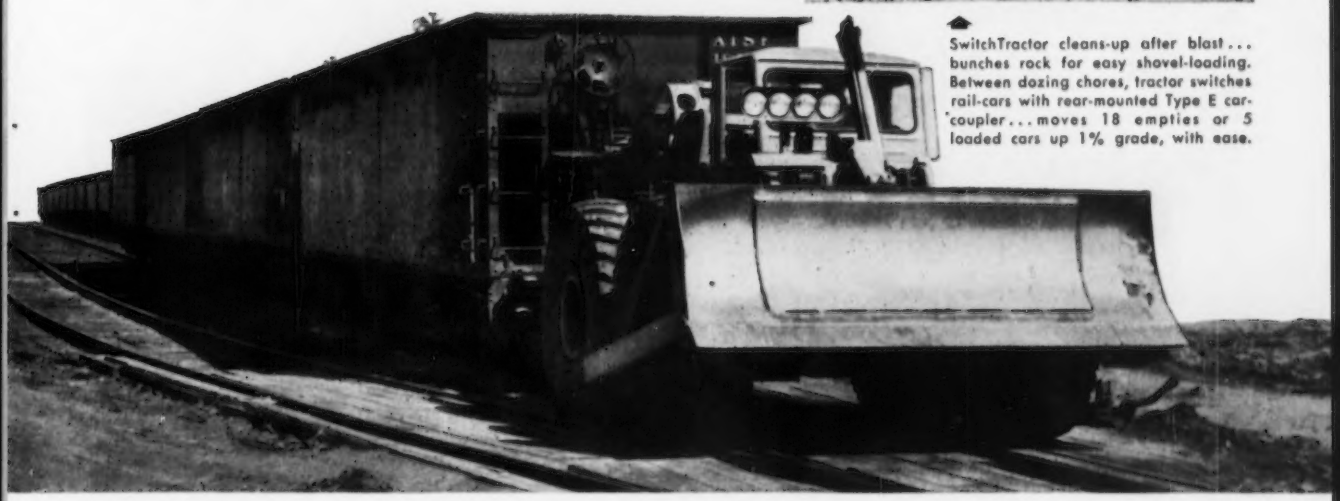
For air-leg drills and light stoping. Removable for full steel life, tapered for more secure union. Same new frontal features as threaded bit.

# TIMKEN REMOVABLE ROCK BITS

TRADE-MARK REG. U. S. PAT. OFF.

**See the first Timken Televent hour, in color, "Eleven against the ice—story of the Antarctica Turnpike". NBC-TV, Monday night, Sept. 23.**

# Double-duty tractor



SwitchTractor cleans-up after blast... bunches rock for easy shovel-loading. Between dozing chores, tractor switches rail-cars with rear-mounted Type E car-coupler... moves 18 empties or 5 loaded cars up 1% grade, with ease.

## SwitchTractor moves rail-cars, does regular tractor work

Here's a big, 208 hp rubber-tired tractor that does double-duty by also switching railroad cars. With its 17 mph speed, and go-anywhere mobility, SwitchTractor works fast ...often switching "for free" in spare time between tractor chores.

### Tournatractor with car-coupler

Cost-cutting SwitchTractor is a regular LeTourneau-Westinghouse Tournatractor—fitted for operation of dozer, angledozer, snow plow, and other attachments. In addition, it is equipped with a standard Type E railway coupler attached on the rear. SwitchTractor can either *pull* a string of cars with its coupler... or *push* them with dozer blade; can safely spot or "hump" cars on many widely scattered tracks in a minimum of time.

### Switch-engine, not tied to tracks

This 208 hp go-anywhere switcher-dozer is always ready to shift rail-cars wherever needed. Rolling on big rubber tires, it maneuvers quickly from spur to spur... moves back and forth between pit, bench, stockpile, plant, dump, or other location. It travels via roads or cross-country ...always takes the fastest route.

When switching cars, SwitchTractor straddles the rails (6'4" between tires), rolls on tie-ends and ballast. It gets better traction, can *pull twice as many cars* as an on-track switcher of the same weight. Big, low-pressure tires do not damage ties, rails, switches, or pavement.

### Saves time on tractor work

Double-duty SwitchTractor also dozes, pulls, and pushes faster than crawlers. Practical work-speeds to 7.5 mph, and top-speed of 17.2 mph, let you handle more plant clean-up and pit maintenance. You build and keep haul roads smoother, open snowed-in roads earlier. You handle shovel clean-up promptly and effectively, spread waste on dumps faster, move utility equipment easier.

On push-and-return work SwitchTractor's constant-mesh transmission with air-actuated clutches, alone, gives you up to 8 minutes extra production per hour. It saves up to 5 seconds, each gear-shift... makes no stops for shifting, loses no momentum... changes direction or gear-ratios *instantly*. In addition, torque-converter (standard equipment) provides uniform and most effective engine speed — with automatic rationing of wheel speed to load — for maximum efficiency in application of power.

### Go-anywhere mobility widens work-range

Because 17 mph SwitchTractor *travels job-to-job twice as fast* as crawlers, it works more productive hours per day... services more pit operations, gets to work faster, handles more work over a wider range of travel. It requires no special planking for moves... no flatbed-hauler, trucks, and extra help.

This rubber-tired L-W SwitchTractor is a two-way money-saver for mine, quarry, or pit. Call or write for complete details and prices.

SwitchTractor—Trademark; Tournatractor—Trademark Reg. U.S. Pat. Off. ST-1355-M-b

**LeTOURNEAU-WESTINGHOUSE COMPANY,** PEORIA, ILLINOIS

*A Subsidiary of Westinghouse Air Brake Company*

**Where quality is a habit**

# GENERAL NYGEN® TIRES

## SPEED UP MOVING 6-MILLION YDS. OF DIRT FOR ALLEGHENY CONTRACTING INDUSTRIES ON HUGE $153-MILLION INDUSTRIAL DEVELOPMENT!

Here, as on thousands of other construction jobs, General Nygen Tires are proving that superior strength *plus* crawler-like traction and flotation, gets the job done faster and *for less!*

Built with exclusive stronger-than-steel Nygen Cord and featuring extra wide, extra deep treads, Generals are unequalled for deep-down drive and dependability.

Hand General Nygen Tires your toughest assignment today and watch them save time . . . build profits!

**THE GENERAL TRUCK TIRE**

*specify* GENERALS *on your new equipment*

**THE GENERAL TIRE & RUBBER CO. • Akron, Ohio**

*At a pit in Germany...*

# 2 Rear-Dumps move 180 tons every hour over 1150 ft. of rough pit floor

At an important German quarry, south of the Ruhr, two Model C Tournapull® Rear-Dumps haul out about 180 tons of blasted limestone rock each working hour.

The German firm, Rheinisch-Westfallische Kalkwerke-Aktiengesellschaft, Dornap, is using these heavy-duty haulers in removing the top layer of a limestone hill at the company's Honnetal quarry. This quarry supplies lime to the chemical and construction industries, and to the steel mills of the Dortmund-Hagen area. Lime dust from this plant is also used in mines to control fires and explosions.

### Body design withstands shock loads

A shovel loads the two Tournapulls (one with an earlier 18-ton capacity, the other a current 22-ton model) with large chunks of limestone. The Rear-Dumps' egg-shaped bowl design tends to safely deflect shocks of loading. According to extensive tests in this quarry, trucks with a box-shaped body could be loaded to only 70% of capacity, while Tournapulls were consistently loaded to 85% and 90% of capacity.

During typical operation, Rear-Dumps haul rock about 1150 feet over the rough pit floor. Each unit delivers about 90 tons hourly to a crushing plant, says Graduate Engineer Hettwer, Technical Manager of the quarry.

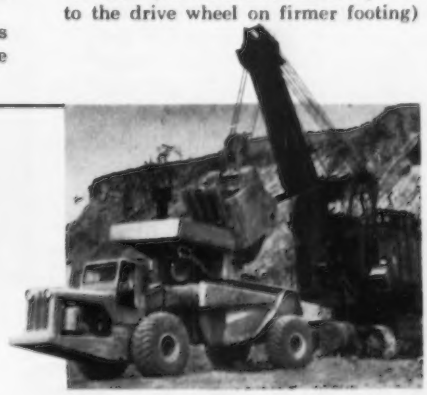
Tournapulls also haul out waste loam and clay from fissures in the rock. On the waste dump, Tournapulls' big, low-pressure tires and power-transfer differential (which channels more power to the drive wheel on firmer footing) provide ample flotation and traction for hauling across loose fill.

### Maneuverability saves time

At times, other types of haul units have been used for transporting rock here. However, they were unable to turn within the narrow space between the pit wall and the shovel's power cable in order to position for loading. Consequently, a bridge had to be laid over the cable for them to drive across. In contrast, Tournapull Rear-Dumps, with their 90° kingpin power-steer, can turn easily in the cable-to-wall space, eliminating the time-robbing practice of having to lay, move, and maintain a plank crossing over the cable.

When you have heavy material to move, or when you must work in a confined space, you will want to know more about Tournapull Rear-Dumps: 11, 22, and 35-ton sizes. Write us for full information on LeTourneau-Westinghouse equipment.

CR-1386-Q-1



Despite the constant shocks of loading this heavy limestone rock, and of hauling over a rough, rocky surface for 16 hours daily, Tournapull Rear-Dumps have needed little repairs. One Tournapull has worked for more than 2¾ years; a second machine for longer than two years. Most months, Rear-Dumps' operating efficiency is over 90%.

**LeTOURNEAU-WESTINGHOUSE COMPANY,** PEORIA, ILLINOIS

*A Subsidiary of Westinghouse Air Brake Company*

**Where quality is a habit**

# BEAUTY...OR BEAST?

We'd be the last to claim that Amsco® Dippers have any inherent glamour. That's why we induced the pert 115-pound* blond to pose in one of our 7-yd. dippers at a recent trade show. Got a lot of attention, too!

But we know that experienced operators *specify* these all-cast Manganese Steel Dippers because they're real "beasts"—when it comes to strength and ruggedness. By way of proof, glance at the other photo. It shows a 9-yd. Amsco Dipper hoisting a 60 to 70-ton* rock out of the St. Lawrence Seaway Channel. There's plenty more proof available, too—on the extra strength, digging ability and long life of Amsco Dippers. That's why they're the number one original-equipment choice on most leading makes of power shovels!

Consult your equipment manufacturer, or write us direct for new booklet on *Amsco Power Shovel Equipment*, giving detailed reasons why Amsco Dippers are real "beasts" when it comes to rugged digging work.

*Estimated

AMERICAN Brake Shoe COMPANY

# AMSCO

American Manganese Steel Division • Chicago Heights, Ill.

OTHER PLANTS IN: DENVER, LOS ANGELES, NEW CASTLE, DEL., OAKLAND, CAL., ST. LOUIS, JOLIETTE, QUEBEC

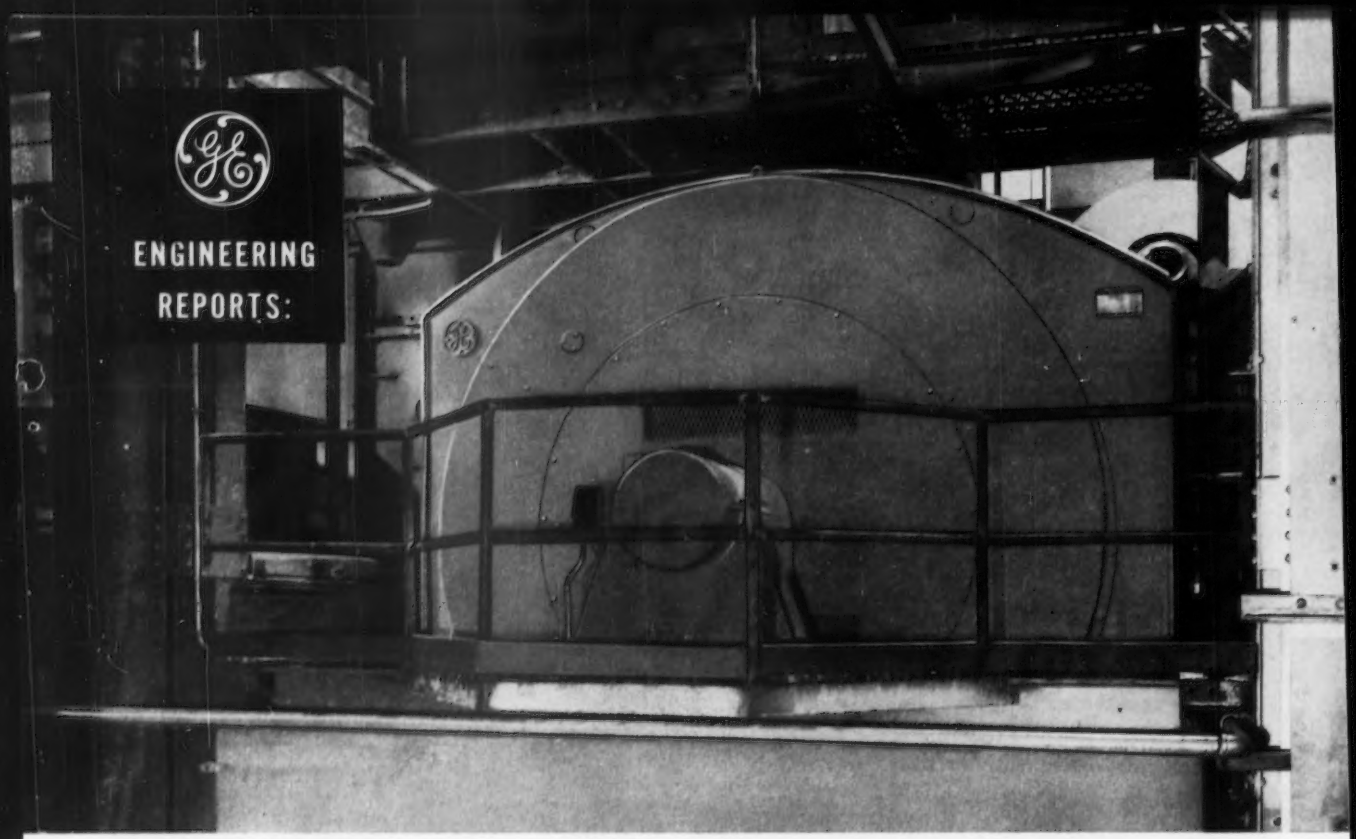
Simplex Wire & Cable Company's new 1,400,000 volt impulse generator — the first of its kind to be installed in North America — represents just one aspect of research at Simplex. Simplex scientists and engineers originated the process of vulcanizing portable rubber cords and cables in a lead mold. Simplex developed the first heavy-duty portable electrical cable — Simplex TIREX. The first truly moisture-resistant rubber insulation was the outcome of a commercially acceptable method of deproteinization developed by Simplex. Simplex designed the first interlocked armored cable for underground service — Simplex CONDEX. And now — Simplex C-L-X — the portable, corrugated metallic duct WITH SEALED-IN CABLE. **SIMPLEX WIRE & CABLE CO.**, Cambridge, Massachusetts and Newington, New Hampshire.

LIVE BETTER ELECTRICALLY

Simplex

*Highest quality cables for:* Mining • Power & Lighting • Construction • Transportation • Communications • Signalling

ENGINEERING
REPORTS:



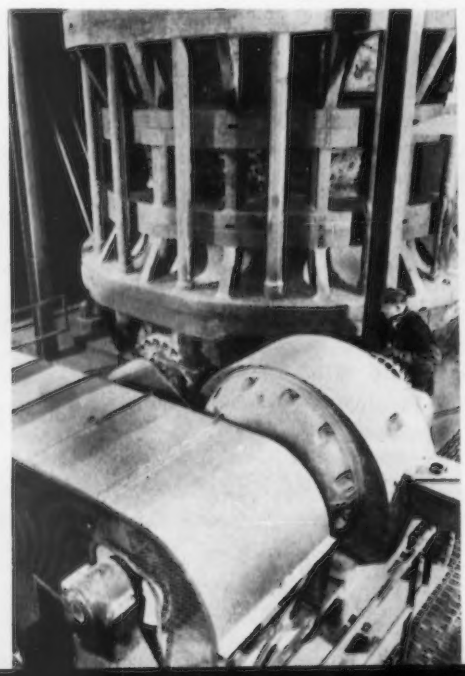
**CAPACITY INCREASE** of 3500 tons of ore per day resulted from installation of new #10 ball mill at Climax driven by this 1000-hp 2300-volt General Electric synchronous motor, giving continuous operation under heavy-duty conditions at high altitude.

## Using General Electric engineered system . . .

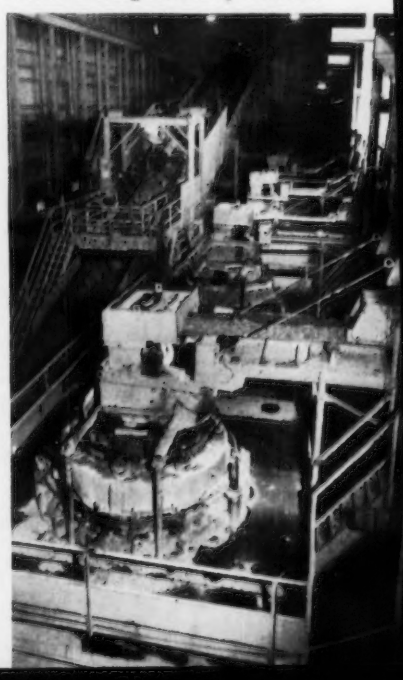
# Climax Molybdenum exceeds

**WITHSTANDING HEAVY** shock loads, this all-fabricated-steel G-E 50-hp motor at mine's Phillipson level drives slusher hoist that dumps ore in cars.

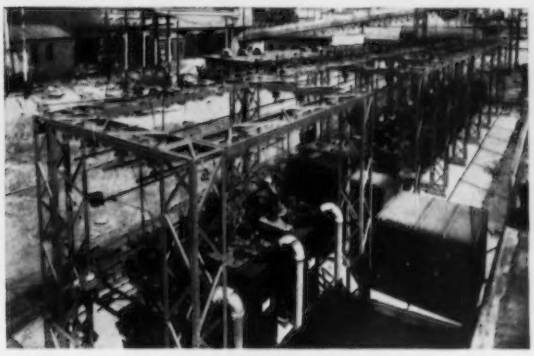
**GYRATORY CRUSHER**—one of world's largest—driven by 500-hp Tri-Clad* motor, is part of G.E.'s early participation in Climax's expansion plan. Located at Storke level. * *Reg. trade-mark of G.E. Co.*



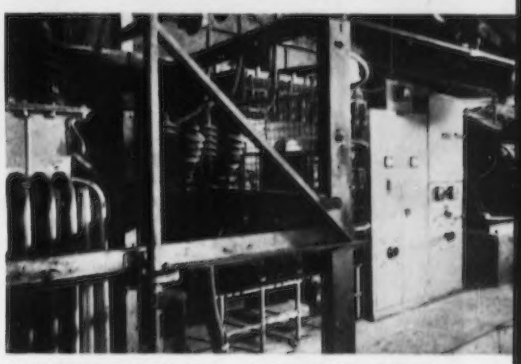
**PROPER MOTOR TORQUES** to meet crushing needs are provided by heavy duty 300-hp G-E synchronous motors driving secondary crushers.



**CENTRALIZED G-E CONTROL** for 1000-hp ball mill drive includes two control consoles (l. and r.) plus (center) Limitamp* high voltage starter and spotter, and motor control center for small drives. * *Reg. trade-mark of G.E. Co.*



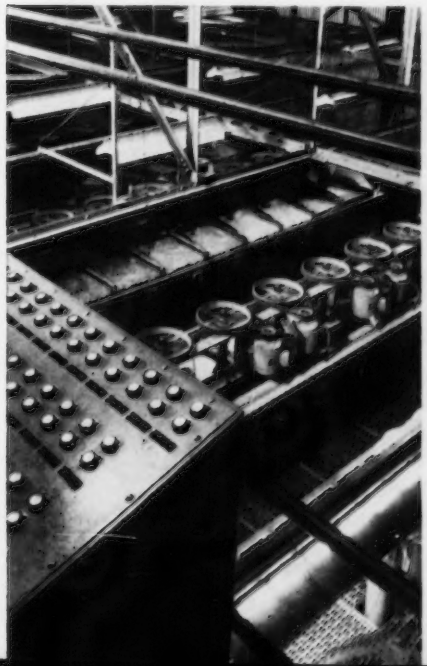
**HIGHLY DEPENDABLE POWER SUPPLY** for new ball mill drive is provided by 2500-kva 13,800/2400-volt G-E master unit substation, recently integrated into substation lineup.



**LINE VOLTAGE DROP** is minimized by G-E power substation and 300-kw motor-generator set (r.), plus control, located underground near the working face.

# former expansion goal by 20%

**FLOTATION CELLS** in Climax number 10 mill are driven by 70 General Electric Tri-Clad motors, in 5- and 7½-hp ratings, (seen below under G-E control console).



## North America's largest underground mine boosts output 3500 tons of ore a day with new ball mill powered by General Electric drive

Continuing its $34 million expansion program which has already produced a record output of 31,000 tons of raw molybdenum ore per day, Climax Molybdenum Company, Climax, Colo., has once again hiked its production by 3500 tons a day with the installation of a complete new ball mill unit, powered, driven and controlled by General Electric system-engineered equipment.

When Climax began its expansion program in 1951—with an immediate goal of 28,000 tons of ore daily—G-E application engineers worked closely with Climax engineers to coordinate the project's electrical system. By helping provide a flexible, efficient electrical system, G.E. at that time helped pave the way for Climax's continued expansion to keep pace with the jet-age demands for the metal.

The same General Electric engineering leadership which helped Climax reach its record output is available to you for your expansion or modernization planning. Contact the nearest G-E Apparatus Sales Office early in the planning stage. General Electric Company, Schenectady 5, New York. 660-36

**Engineered Electrical Systems for the Mining Industry**

**GENERAL ELECTRIC**

# WATCH FOR FIRESTONE WHERE BIG PROJECTS BEAT SCHEDULES!

**Firestone Rock Grips lead all tire choices for heavy equipment on all job conditions!**

Firestone Tubeless Rock Grips save time two ways! Off-highway users make them their first choice of tires for beating downtime losses. They're top choice, too, when it comes to rolling heavy equipment over all types of terrain. Two great treads eliminate your need for changing tires to match the job. You get the *full flotation* you need for sand and soft stuff. And the same tread gives you the *armored grip* you want for hauls over rock or rubble. Safety-Tensioned *Gum-Dipped*® NYLON bodies, combined with specially compounded treads, defy cuts and slugging impacts. Ask your Firestone Sales Engineer about these heavy construction favorites. Contact him today—through your local Firestone Dealer or Store.

Enjoy the Voice of Firestone on ABC television every Monday evening.

ROCK GRIP WIDE BASE ROCK GRIP

Firestone

BETTER RUBBER FROM START TO FINISH

*Copyright 1957, The Firestone Tire & Rubber Company*

This 240,000-pound steam drum, built by Combustion Engineering for a large generating plant, is here being hoisted 120 feet into position by strong wire rope. It's a striking example of how . . .

# safety rides on quality wire rope

You may never hoist loads as large as this 120-ton drum. But *safe, top quality wire rope is just as important to your own operations.* For, although the price of a "bargain" rope would be less, failure of such a rope could cost you thousands of dollars in wrecked equipment. Don't be a victim of false economy. Buy a wire rope that's a quality rope—buy Wickwire Rope.

5339

WICKWIRE ROPE — A CF&I PRODUCT

CF&I

LOOK FOR THE YELLOW TRIANGLE

PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

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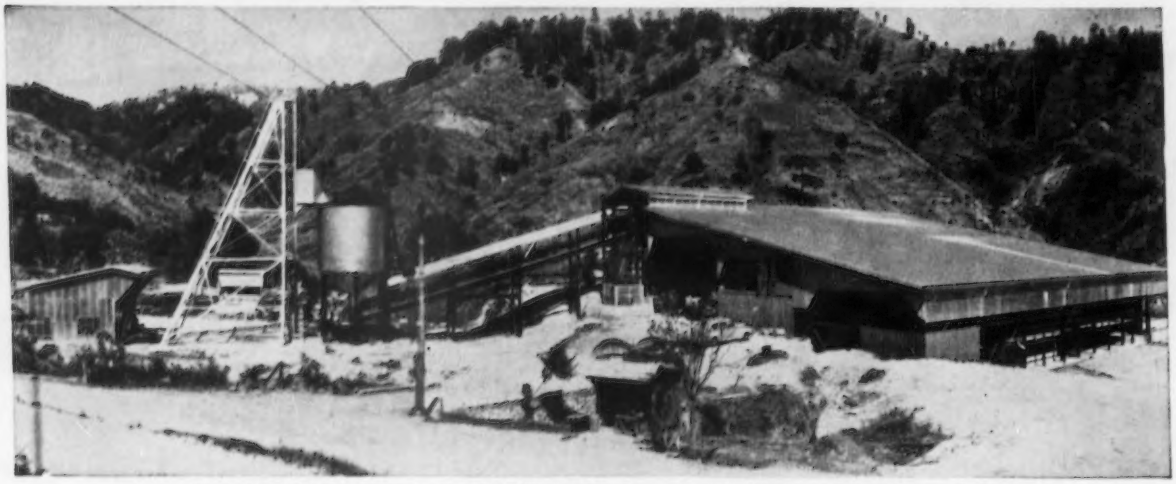
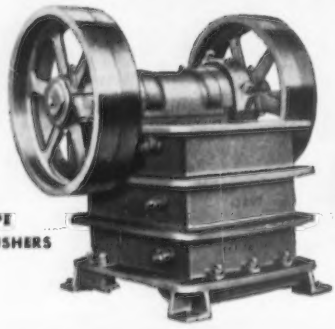
# MINING EQUIPMENT



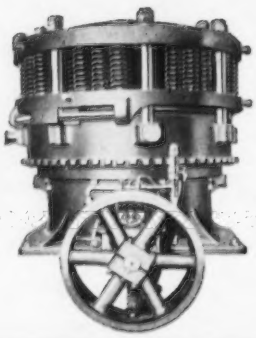
Baguio Gold Mining Company's mill in the Philippine Islands uses all of the Telsmith equipment shown below.

## BY TELSMITH



JAW TYPE PRIMARY CRUSHERS

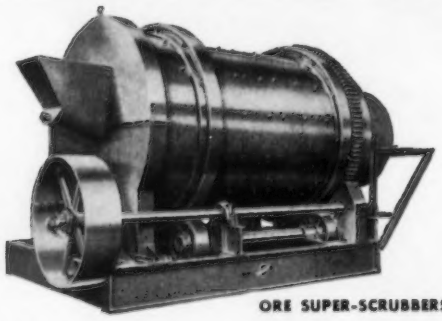
SEND FOR DESCRIPTIVE BULLETIN 266



GYRASPHERE SECONDARY CRUSHERS

VIBRATING SCREENS

Min. 39



ORE SUPER-SCRUBBERS

**SMITH ENGINEERING WORKS**

**502 E. CAPITOL DRIVE** **MILWAUKEE 1, WISCONSIN**

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**Prospecting.** The Universal 'Jeep'* with the extra traction of its 4-wheel drive, takes men and equipment anywhere on the lease for prospecting, exploring or survey work. It climbs grades as steep as 60%, goes where other vehicles can't go.

# Speed your mining operations with 'Jeep' versatility and all-wheel traction!

**The new and bigger Forward Control 'Jeep' FC-170 Truck.** This 7,000-lb. GVW workhorse puts a 9-ft. pickup box on a 103½-inch wheelbase. You get unequalled cargo space per inch of wheelbase and 'Jeep' maneuverability to carry payloads up to 3500-lbs. almost anywhere!

**Mobile power.** The versatile 'Jeep' gets to the job with sure dependability, and with power take-off supplies its own power to operate a portable drill, above. It also operates winches, welders, compressors, generators and many other types of equipment.

Rugged 'Jeep' vehicles are always on-the-job, in virtually every phase of mining. From initial surveys to transportation of men and equipment in the field, they help keep operations on schedule every day of the year.

No other vehicles match the 'Jeep' family for all-around mobility, range of performance and go-anywhere ability. On the highway they travel at top legal speeds in conventional 2-wheel drive. But, when the going gets tough, the extra traction of their 4-wheel drive hauls trailers in trackless mining, or carries personnel with parts and supplies over rugged terrain, through mud, snow or soft earth — in good weather or bad — to help keep maintenance and service work moving smoothly. These vehicles go where others stop cold in the heavy, rough going of mining projects.

'Jeep' vehicles supplement heavy-duty equipment, spread their costs over a wide variety of jobs, give you additional savings through long life and low maintenance costs. Ask your Willys dealer for a practical, on-the-job demonstration.

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**family of 4-Wheel-Drive Vehicles**

**WILLYS... makers of the world's most useful vehicles**

**Model CJ-5 shown*

WILLYS MOTORS, INC., TOLEDO 1, OHIO

# USERS SAY R/M BELTS AND HOSE GIVE YOU

## Ray-Man Conveyor Belt... Lower Cost per Ton Carried

Cushioned strength members . . . with double compensation to relieve stress on outer plies . . . give Ray-Man Conveyor Belt unusual flexibility to permit fuller loads . . . even where relatively thick, narrow belts are used . . . or where pulleys are small. Holds fasteners under the most severe conditions. No breaker ply required. Use of newest synthetic super-strength fibers insures even greater service than ever before. Like all R/M heavy duty conveyor belts, Ray-Man is moisture resistant . . . mildew-proof . . . and protected against wear, tear, cuts and abrasions with R/M's exclusive and remarkably tough "XDC" Cover. Ray-Man cuts handling costs because it does a bigger job, better . . . and *lasts longer.*

***Write for Bulletin #6915***



● TRAINS NATURALLY

● RESISTS IMPACT

● DOUBLE COMPENSATION RELIEVES OUTER PLY STRESSES

**Ask an R/M representative how these features of Ray-Man Conveyor Belt add up to lower cost per ton handled . . .**

***"More Use per Dollar"***

# "More Use per Dollar"

## R/M Poly-V® Drive Delivers More Power in *Less Space!*

Unique patented design accounts for the extra power capacity of R/M Poly-V* Drive. A single, endless belt, with lengthwise parallel V-ribs running on sheaves designed to mate precisely with the belt ribs gives Poly-V high V-groove *grip* . . . *plus* flat belt *strength* . . . *twice* the tractive surface to deliver more power than ever before possible! Narrower sheaves can deliver *equal* power in as little as ⅔ the space required for a conventional V-belt drive . . . or up to 50% *more* power in the *same* space! This means *less* shaft overhang . . . *less* drive weight . . . *less* bearing load.

Poly-V eliminates multiple-belt "length matching" problems. Inventories of belts and sheaves are cut because just *two* belt cross sections meet every heavy-duty requirement.

***Write for Bulletin #6638***

**And...for the "Smoothest Running V-BELTS Made," Specify CONDOR and R/M SUPER-POWER V-BELTS**

*Poly-V is a registered Raybestos-Manhattan Trademark.

## Homoflex Air Hose is Easy to Handle...Longer Lasting!

Bulk and stiffness are engineered *out* of Homoflex Hose . . . it's light, yet strong . . . "flexible as a rope" . . . *safe* for the toughest jobs! Homoflex Hose gets more work done . . . and it *lasts longer*. Get Bulletin #6879.

RM-701

**BELTS • HOSE • ROLL COVERING • TANK LININGS • INDUSTRIAL RUBBER SPECIALTIES**

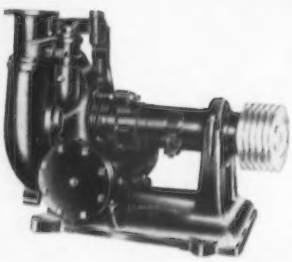
**MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY**

# RAYBESTOS-MANHATTAN, INC.

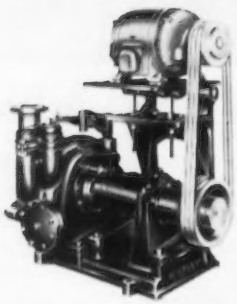
Other R/M products: Abrasive and Diamond Wheels • Brake Blocks and Linings • Clutch Facings • Asbestos Textiles • Mechanical Packings • Engineered Plastics • Sintered Metal Products • Industrial Adhesives • Laundry Pads and Covers • Bowling Balls

# WILFLEY SAND PUMPS

## LOW COST PUMPING



The new patented WILFLEY MODEL "K" centrifugal sand pumps are designed for maintained high efficiency in rugged service and trouble-free operation. They combine the original WILFLEY principles with new improvements developed through years of engineering experience.



BELT DRIVEN, overhead V-belt driven and direct driven WILFLEY Model "K" pumps available in 1", 1½", 2", 2½", 3", 4", 5", 6", and 8" discharge sizes with capacities to 3000 GPM and heads as high as 200'.

WILFLEY SAND PUMPS may be fitted with interchangeable electric furnace alloy iron or rubber covered wear parts to best meet the requirements of each pumping installation. The WILFLEY wear part design is ideal for rubber covering as ample clearance around the runner assures a practical and dependable rubber lined pump. Wherever you have a solids transfer job specify the WILFLEY Model "K" sand pump — for continuous, trouble-free performance, simple installation and stepped-up production.

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Willey Sand Pumps
"Companions in Economical Operation"
Willey Acid Pumps

ENGINEERING AND MINING JOURNAL

SEPTEMBER 1957

# How to Avoid Confusion In An Age of Fission and Fusion

For those of us who learned our mineralogy and metallurgy in the Thirties or earlier, it's been hard enough to get used to the new family of uranium minerals including such jawbreakers as schroeckingerite and tyutamunite; but now that the indusrial world is poking its nose in Nature's garbage-can full of rare-earth constituents for commercial products, we often wonder how long we will be able to hang on.

For instance, did you notice the advertisement last month which offered to buy concentrates of xenotine, thortveitite, thorite, gadolinte or fergusonite? Now we don't know whether you have any xenotine or gadolinite, but if you do, you should know that xenotine is preferable to gadolinite because it contains more rare earths.

We learned this in the Atomic Energy Commission's mid-year report which also mentions that private industry is now taking over the commercial production of rare-earth elements on an increasing scale. This report also refers to a new ion-exchange process which separates lutetium, ytterbium, thulium, erbium and holium from one another. All of which means that we will have to get better acquainted with many new elements and learn about the new processes to recover them.

This surging demand for new mineral products to supply a fast-changing world of atomics, gadgets and super-speed is having a profound effect on mineral processing. It has introduced entirely new extractive methods such as ion-exchange, pressure leaching and reduction, solvent extraction; and many others which are now in the patent stage of development.

This revolution in metal and mineral processing is not on the horizon—it has arrived. If you have any doubts about this, just ask any ex-cyanide man in a uranium mill who is now busy making eluates out of eluants in the ion-exchange circuit. Or, better still, take a look at Nicaro's flowsheet on pp 84-87 of this issue.

Now how can we keep up with this fast-changing field of mineral processing and apply the new techniques in our mills and smelters to best advantage?

Since Korea, mining companies, Government agencies, technical publications, and industry conventions have released a flood of new mineral-processing information. So the problem is not one of gathering source material, but rather classifying it and evaluating it.

One of the best "flowsheets of logic" to assist in evaluating mineral processes was proposed by Dr. Raymond Vener in *E&MJ* July 1956 under the title "A Modern Metallurgical Classification System." We recommend rereading this before you tackle a new mineral processing problem. Here's how the system works:

1. First review available processes to extract a desired mineral concentrate or product. If you are working with uranium, you can choose from at least 11 basic flowsheets. See "If You're Planning Uranium Extraction, Take a Look at Today's Flowsheets." by William Lennemann, *E&MJ* mid-June Guidebook 1956.

2. Next break the selected flowsheet down into unit operations. Here you start with three basic phases—solids, liquids and gases. Each unit operation generally involves two phases, so you arrive at six possible combinations—solids-solids, solids-liquid, solids-gas, gas-gas, liquid-liquid, and liquid-gas.

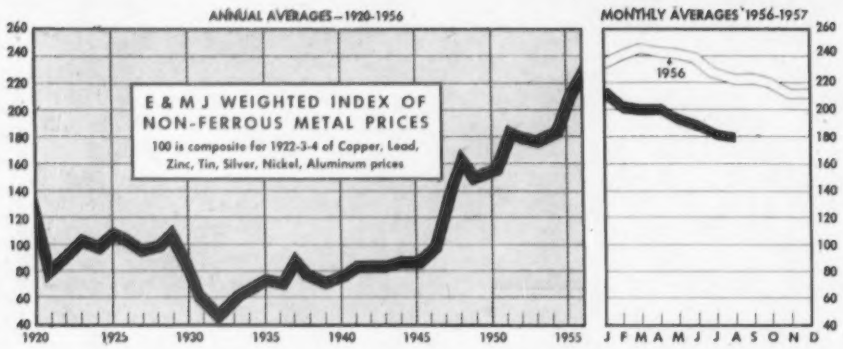
3. Each combination of phases can be subjected to one of three operations—contacting, separation or mixing.

4. Finally you have a choice of from five to ten different methods or equipment units to contact, separate or mix these basic phase couples. Thus, for instance, if you want to precipitate a uranium compound from a clarified pregnant solution you look under the heading "solids-liquid contacting." Here you will find that the job might done by ion exchange, adsorption, heterogeneous catalysis, precipitation, chemical conversion or dissolution.

Thus the secret to analysis of a mineral processing problem lies in asking ourselves "What are we trying to do?" before we ask "How are we going to do it?" A careful answer to the first and more basic question will insure a more imaginative and satisfactory answer to the second.

# E&MJ OUTLOOK

## PRICES




## MARKETS

**E&MJ's metal price index** slipped again in August. See next page for explanation.

**Federal Reserve Board's index** of industrial output for the first six months of 1957 averaged 146, compared with 143 for the same 1956 period. August should see a traditional five to six-point upturn. If this doesn't materialize, metal sellers will show some concern about fourth-quarter sales volume.

**Building materials** and industrial products manufacturers expect U. S. housing construction to reach 900,000 to 950,000 units in 1957.

●

## LABOR

**Labor legislation** is shifting from the national scene to the states. In 1957, 45 states took action—mostly in the direction of shoring up minimum wages and unemployment benefits. See p 123.

●

## AT HOME

**AEC estimates that uranium production** in the Western States for 1958 should be approximately $236-million. By the end of 1958, domestic uranium production should be about 14,000 tons of uranium oxide per year.

**Despite the early 1957** gloom in the auto industry, production this year is running nearly 10% ahead of production for the similar 1956 period.

**Research at Argonne laboratories** indicates that molten zinc is a good medium for purification of uranium in spent reactor fuel elements. Other literature in the nucleonics field hints that molten zinc might be used in pyrometallurgical processes to extract a whole spectrum of elements by a method analogous to differential precipitation.

**Corrosion Research Council** is looking for financial and industry support to handle a program of fundamental research in the field of corrosion. With the zinc industry's big stake in galvanizing and cathodic protection of pipelines and ships, it might be advisable to channel some support to the council.

●

## ABROAD

**Peñoles, subsidiary of American Metal Co.,** has embarked on a $1,450,000 program to extend the life of its lead-zinc property at Zacatecas. A reduction in export and production taxes by the Mexican government encouraged the move.

**Rustenburg Platinum Mines,** South Africa, is pushing a £1.8-million expansion program which will increase the company's milling rate to 2.5-million tons of ore per year, and boost platinum output to 80% above the 1955 rate.

**Johns-Manville** reports that although its reserves at Asbestos, Que., are "the finest in the world," the company is debating whether to further develop these reserves or to develop other new orebodies which the company owns in Canada.

**J. F. T. Naude,** South Africa's Minister of Finance, pressuring for a higher gold price, said "It could be a wonderful thing if the value of America's gold holdings suddenly were to rise. It would enable the U. S. to meet many of its foreign aid commitments."

# MARKETS

## Metal Markets Soft; Copper Prices Down; Tariff Legislation Out

NONFERROUS METAL PRICES DROPPED to 182.59% of the 1922-'24 average in August; it was 184.17 in July. The drop would have been much greater except the one cent rise in aluminum largely offset the drop in copper and tin. U. S. copper dropped from 28.69c to 28.12c in August. The weighted average primary aluminum ingot price rose from 27.1c in July to 28.086c in August.

**Lead-zinc tariff legislation** is out for this session of Congress, but the Administration suggests requests from industry through the normal Tariff Commission procedure might get favorable action. Normally, the Commission must make a thorough investigation that might take many months, but some observers believe so much information is already available it would not take long. But they suggest it would not be wise for industry to get very optimistic.

**Copper prices dropped** during August. Phelps Dodge dropped its price delivered to U. S. consumers to 28½c Aug. 6; all other producers in the U. S. followed, though Anaconda held off until Aug. 8. International Nickel dropped to 27c in Canadian currency. RST dropped its price Aug. 12 to U. K. buyers to £210, about 26¼c. Katanga dropped to 25.9c, c.i.f. Antwerp or N. Y. on Aug. 29; it had dropped to 26.8c Aug. 22. Custom smelter metal in the U. S. was sold at under 27c by the end of the month. The smelter No. 2 copper scrap buying quotation was 20½c. London reached £201½, about 25.05c, for prompt bid. Many expect it to break £200.

Sept. 3 and 4, U. S. producers dropped to 27c; Katanga dropped to 25.45c. There is no sign of improvement in the copper market. Perhaps most significant is the high level of fabricator stocks—copper product buyers have little fear of a market turn-around.

**Producers' stocks** of refined copper in the U.S. rose to 191,515 tons in July; foreign stocks rose to 238,715 tons. The total is much higher than the maximum early in 1954, when there was much concern about the weak copper market. Shipments of refined copper to fabricators, and shipments by fabricators of products to their customers, remain far under the output of refined copper.

**The British Board of Trade** announced it will sell 27,000 tons of copper from its stockpile. First offerings will be made in October, probably about 2,700 tons. The Spanish government bought $6-million of blister copper from Kennecott for 23.7c, f.o.b. Houston, Tex. Spain insisted on flat price bids. About 11,500 tons were sold and will be shipped rather evenly through May 1958. Anaconda bid 24.53c for any to be shipped the first month but with a constantly higher price for each shipment in later months.

**Lead sales** were better than early in the summer. GSA bought Aug. 29 about the same as in the preceding month, probably 4 to 5,000 tons. Though sales as reported to *E&MJ* for August and also July were higher than in April, May and June, lead factors see no rise in prices.

There are indications U. S. stockpiling of lead and zinc may cease or drop greatly this fall or winter.

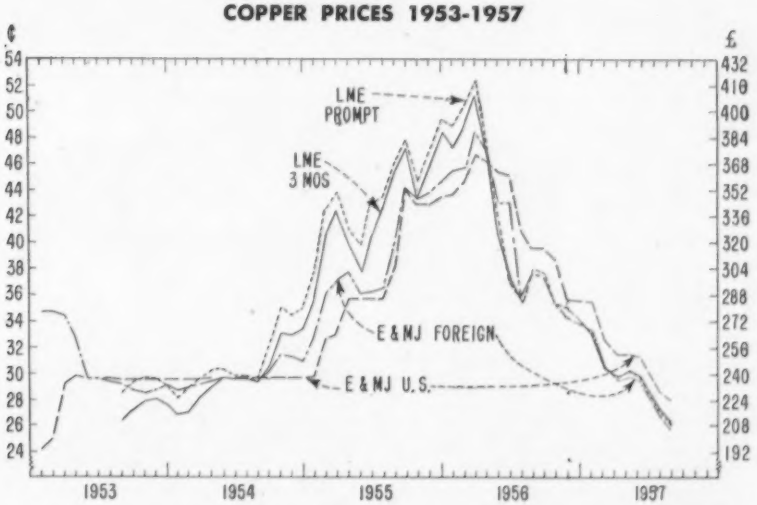
**Zinc sales in August** were good relative to the spring and early summer and probably equal to July. They are still greatly under U.S. output. GSA bought Aug. 29 about the same amount as in July, probably about 10- to 11,000 tons. Eagle-Picher suspended output again at its Tri-State mines and New Jersey Zinc stopped ore output (1,800 tpm) at Ogdensburg. The British Board of Trade will sell 27,000 tons of its zinc stocks. Of this, 9,000 will be for fall delivery.

**Aluminum markets remain soft.** They would have been softer except that Alcan has "lost" about 110,000 tons owing to the Arvida strike in Quebec. Negotiations have been reopened between the union and management. Alcoa's and Kaiser's problem in getting the U. S. Government to accept "put" aluminum is unsettled. But the Government apparently will not take much—it believes their importing large amounts from Alcan makes "putting" to the Government in the full amount improper. Alcoa is cutting output at its Massena plant.

**Tin prices** in London and the U.S. fell in August. London came within almost ½c of the cartel's compulsory buying price (£730—about 90.7c at present exchange rates.) Many factors believe it will reach £730—most think the cartel will have enough funds to keep the price at this figure through this year and possibly much of next year.

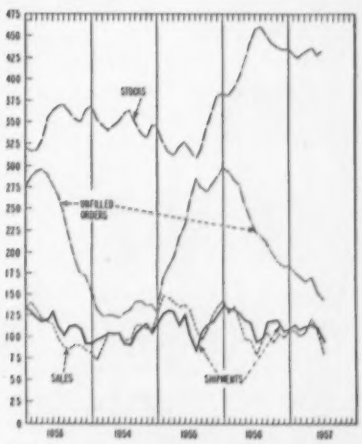
**FOR MINING EXECUTIVES** concerned with day-to-day changes in metal and ore prices and authoritative interpretation of metal market trends and developments, *E&MJ* publishes a weekly market information service, *E&MJ METAL AND MINERAL MARKETS*. More details and a handy order form will be found in the advertisement on page 224 of this issue.

**COPPER PRICES 1953-1957**




Monthly averages. *E&MJ* weighted averages are computed from actual reports of sales to *E&MJ*—normally 140,000 to 175,000 tons per month. LME prices are the average of the mean of the bid and asked; they refer to long tons. The two scales are equal at an exchange rate of $2.80 per £. £320 is 40c a lb, etc. Data through August 1957.

**U. S. Copper Fabricator Data**




U. S. Copper Association data, thousands of short tons, through July. Sales and shipments are for fabricated products (as are unfilled orders) and are two months moving averages.

# MARKETS (*Continued*)

## Average Prices Aug. (*E&MJ Quotations*)

| | |
|---|---|
| **Copper:** | |
| Electrolytic, domestic refinery | 28.098 |
| Electrolytic, export refinery | 25.694 |
| **Lead:** | |
| Common, New York | 14.000 |
| Common, St. Louis | 13.800 |
| **Silver and sterling exchange:** | |
| Silver, New York, per oz. | 90.909 |
| Silver, London, pence per oz. | 78.750 |
| Sterling Exchange | 278.274 |
| **Zinc:** | |
| Prime Western, East St. Louis | 10.000 |
| Prime, Western, delivered (g) | 10.500 |
| **Tin:** | |
| New York Straits | 94.218 |
| **Gold** per oz. U. S. price | $35.000 |
| **Quicksilver,** per flask | $251.111 |
| **Antimony,** (E&MJ)(d) | 36.590 |
| **Antimony,** bulk, Laredo | 33.000 |
| **Antimony,** in cases, Laredo | 33.500 |
| **Platinum,** refined, per oz. | $84.000 |
| **Cadmium** (a) | 170.000 |
| **Cadmium** (b) | 170.000 |
| **Cadmium** (c) | 170.000 |
| **Aluminum,** 99% plus ingot | 28.086 |
| **Magnesium,** ingot | 35.250 |
| **Nickel** (f) | 74.000 |

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lb.

(a) Cadmium average based on the producers' quotations.

(b) Cadmium average based on the average of the producers' and platers' quotation.

(c) Cadmium average based on platers' quotation.

(d) Domestic, 5 tons or more but less than carload lots, packed in case f.o.b. New York.

(f) Contract price, f.o.b. Port Colborne, U.S. duty included. Other regular sellers 78¼¢ to $1.25.

(g) Delivered where freight exceeds 0.5c.

## "Free" Gold Market

Transactions are at the highest level in 18 months. Paris dealings were up to $4-million a day. No Soviet gold sales were reported from Europe. Far East markets were active with India showing huge transactions on currency transfer. Europe is again hoarding gold. South American trading was quiet. Brazil again listed the world's lowest gold price, $34.75 per oz. Pick's World Currency Report quotes on "free gold" per fine oz, as follows:

| | COINS | | BARS (12.5 kg) | |
|---|---|---|---|---|
| | July 31 | Aug. 30 | July 31 | Aug. |
| NEW YORK, transit | ..... | ..... | $35.08 | $35.08½ |
| MANILA | $43.25 | $44.00 | 36.30 | 36.40 |
| HONG KONG | 45.00 | 45.00 | 38.00 | 38.15 |
| BOMBAY | 56.80 | 57.25 | 54.50 | 56.00 |
| TANGIER | 42.65 | 43.50 | 34.90 | 35.20 |
| BEIRUT | 43.00 | 43.10 | 35.13 | 35.10 |
| PARIS | 44.75 | 44.50 | 36.90 | 36.35 |
| BUENOS AIRES | 38.15 | 39.25 | 35.40 | 35.65 |

Note: Prices are quoted at the free or black market value of the U. S. dollar in the local markets.

## Major Metals

### U. S. DAILY AND AVERAGE PRICES

| August 1957 | Electrolytic Copper (a) Domestic | (b) Export | Lead New York | Lead St. Louis | Zinc (f) Delivered | Zinc East St. Louis | Aluminum Primary Pig 99% | Straits Tin New York |
|---|---|---|---|---|---|---|---|---|
| 1 | 28.750 | 26.250 | 14.000 | 13.800 | 10.500 | 10.000 | 25.875 | 95.250 |
| 2 | 28.750 | 26.200 | 14.000 | 13.800 | 10.500 | 10.000 | 25.875 | 95.250 |
| 3 | No Market | 26.200 | 14.000 | 13.800 | 10.500 | 10.000 | 25.875 | 95.250 |
| 5 | 28.850 | Holiday | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 95.375 |
| 6 | 28.075 | 26.200 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 95.375 |
| 7 | 28.100 | 26.075 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 94.750 |
| 8 | 28.100 | 25.975 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 94.500 |
| 9 | 28.075 | 26.000 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 94.375 |
| 10 | No Market | 26.000 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 94.375 |
| 12 | 28.075 | 25.650 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 94.375 |
| 13 | 28.075 | 25.900 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 94.000 |
| 14 | 28.075 | 25.875 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 94.250 |
| 15 | 28.000 | 25.450 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 94.500 |
| 16 | 28.025 | 25.975 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 94.375 |
| 17 | No Market | 25.975 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 94.375 |
| 19 | 27.975 | 26.125 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 94.375 |
| 20 | 28.000 | 26.075 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 94.375 |
| 21 | 27.900 | 25.900 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 94.125 |
| 22 | 27.900 | 25.750 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 94.000 |
| 23 | 28.025 | 25.675 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 93.750 |
| 24 | No Market | 25.675 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 93.750 |
| 26 | 28.000 | 25.200 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 93.375 |
| 27 | 27.850 | 24.875 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 93.250 |
| 28 | 27.800 | 24.925 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 93.375 |
| 29 | 27.900 | 24.675 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 93.125 |
| 30 | 27.850 | 24.725 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 93.000 |
| 31 | No Market | 24.725 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 93.000 |
| **AVERAGES FOR MONTH** | | | | | | | | |
| August | 28.098 | 25.694 | 14.000 | 13.800 | 10.500 | 10.000 | 25.986 | 94.218 |
| **AVERAGES FOR WEEK** | | | | | | | | |
| August 7 | 28.505 | 26.185 | 14.000 | 13.800 | 10.500 | 10.000 | 25.938 | 95.208 |
| 14 | 28.080 | 25.900 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 94.313 |
| 21 | 27.980 | 25.917 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 94.354 |
| 28 | 27.915 | 25.350 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 93.583 |
| **CALENDAR WEEK AVERAGES** | | | | | | | | |
| August 3 | 28.620 | 26.313 | 14.000 | 13.800 | 10.500 | 10.000 | 25.438 | 95.479 |
| 10 | 28.240 | 26.050 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 94.792 |
| 17 | 28.050 | 25.804 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 94.313 |
| 24 | 27.960 | 25.867 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 94.063 |
| 31 | 27.880 | 24.854 | 14.000 | 13.800 | 10.500 | 10.000 | 26.000 | 93.188 |

## Silver, Gold and Sterling

### DAILY AND AVERAGE PRICES

| August 1957 | Silver (c) New York | Silver London | Sterling Exchange | Gold London | Gold (d) United States |
|---|---|---|---|---|---|
| 1 | 90.875 | 78.125d. | 278.3750 | 251s. 5¼d. | $35.00 |
| 2 | 90.875 | 78.625d. | 278.3125 | 251s. 5½d. | 35.00 |
| 3 | (e) | (e) | (e) | (e) | 35.00 |
| 5 | 90.875 | Holiday | 278.3125 | Holiday | 35.00 |
| 6 | 91.125 | 78.625d. | 278.2500 | 251s. 5¼d. | 35.00 |
| 7 | 91.125 | 78.875d. | 278.2062 | 251s. 4½d. | 35.00 |
| 8 | 91.125 | 78.875d. | 278.2500 | 251s. 4¼d. | 35.00 |
| 9 | 91.125 | 78.875d. | 278.2187 | 251s. 4¾d. | 35.00 |
| 10 | (e) | (e) | (e) | (e) | 35.00 |
| 12 | 91.125 | 78.875d. | 278.2187 | 251s. 5¼d. | 35.00 |
| 13 | 91.125 | 78.875d. | 278.2187 | 251s. 5d. | 35.00 |
| 14 | 91.125 | 78.875d. | 278.2187 | 251s. 4½d. | 35.00 |
| 15 | 91.125 | 78.875d. | 278.2187 | 251s. 4d. | 35.00 |
| 16 | 90.875 | 78.875d. | 278.1875 | 251s. 4d. | 35.00 |
| 17 | (e) | (e) | (e) | (e) | 35.00 |
| 19 | 90.875 | 78.875d. | 278.3281 | 251s. 2¼d. | 35.00 |
| 20 | 90.875 | 78.875d. | 278.5000 | 251s. 0d. | 35.00 |
| 21 | 90.875 | 78.875d. | 278.3593 | 251s. ¼d. | 35.00 |
| 22 | 90.875 | 78.750d. | 278.2812 | 251s. 3d. | 35.00 |
| 23 | 90.875 | 78.750d. | 278.2187 | 251s. 3d. | 35.00 |
| 24 | (e) | (e) | (e) | (e) | 35.00 |
| 26 | 90.625 | 78.750d. | 278.3562 | 251s. 2d. | 35.00 |
| 27 | 90.625 | 78.625d. | 278.2812 | 251s. 1¼d. | 35.00 |
| 28 | 90.625 | 78.625d. | 278.2500 | 251s. 3d. | 35.00 |
| 29 | 90.625 | 78.625d. | 278.2500 | 251s. 3¼d. | 35.00 |
| 30 | 90.625 | 78.625d. | 278.2187 | 251s. 3¼d. | 35.00 |
| 31 | (e) | (e) | (e) | (e) | 35.00 |
| **AVERAGES FOR MONTH** | | | | | |
| Aug. | 90.909 | 78.750d. | 278.274 | — | 35.00 |
| **AVERAGES FOR WEEK** | | | | | |
| Aug. 7 | 90.975 | — | 278.291 | — | 35.00 |
| 14 | 91.125 | — | 278.225 | — | 35.00 |
| 21 | 90.925 | — | 278.319 | — | 35.00 |
| 28 | 90.725 | — | 278.277 | — | 35.00 |

Calendar Week Averages: New York Silver: Aug. 3rd, 90.625; 10th, 91.075; 17th, 91.075; 24th, 90.875; 31st, 90.625.

(e) No Market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.400c per pound, the average differential for delivery charges.

(b) Our export quotations for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.125c for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingots; cathodes are sold at a discount of 0.125c to 0.15c per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East, Middle West, and West effective Jan. 1, 1951, commanded a premium of 1.35c per pound over the current market for Prime Western; Special High Grade 1.75c effective Dec. 1, 1955.

(f) Prime Western delivered where freight from E. St. Louis exceeds one-half cent.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 pounds.

(c) The daily silver quotation reported by Handy & Harman, in cents and fractions of a cent per troy ounce, is the price paid by Handy & Harman in settlement for silver contained in unrefined silver-bearing materials submitted to them for refining. It is determined on the basis of offers of bar silver .999 fine as made to Handy & Harman for nearby delivery at New York by regular suppliers in quantities sufficient to meet daily requirements, and it is usually one quarter cent below the price at which such offers are made.

The Treasury's purchase price of newly mined domestic silver is 90.5 per troy ounce 1000 fine effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

# London Metal Exchange Quotations

| August | COPPER Cash Bid | COPPER Cash Asked | COPPER 3 Mo. Bid | COPPER 3 Mo. Asked | LEAD Current Month Bid | LEAD Current Month Asked | LEAD 3 Mo. Bid | LEAD 3 Mo. Asked | ZINC Current Month Bid | ZINC Current Month Asked | ZINC 3 Mo. Bid | ZINC 3 Mo. Asked | TIN Cash Bid | TIN Cash Asked | TIN 3 Mo. Bid | TIN 3 Mo. Asked |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 213 | 213¼ | 215¾ | 216 | 91¼ | 91½ | 91¾ | 92 | 72½ | 72¾ | 72¼ | 72½ | 744 | 745 | 742½ | 743½ |
| 2 | 212 | 212¼ | 215¼ | 215½ | 91¼ | 91½ | 91¾ | 92 | 72½ | 72¾ | 72¼ | 72¾ | 742½ | 743 | 741 | 742 |
| 5 | Holiday | | | | | | | | | | | | | | | |
| 6 | 212½ | 213 | 215½ | 216 | 91¾ | 92 | 92¼ | 92½ | 73½ | 73¾ | 73¼ | 73½ | 743 | 744 | 742½ | 743 |
| 7 | 210¾ | 211 | 213¾ | 214¼ | 92 | 92¼ | 92¼ | 92½ | 73½ | 73¾ | 73¼ | 73½ | 740½ | 741 | 741 | 741½ |
| 8 | 209½ | 209¾ | 212 | 212¼ | 91½ | 91¾ | 91½ | 91¾ | 72¾ | 73 | 72½ | 72¾ | 738½ | 739 | 739 | 739½ |
| 9 | 209¼ | 209¾ | 211¾ | 212 | 91½ | 91½ | 91½ | 91¾ | 73¾ | 74 | 73 | 73¼ | 739 | 740 | 739½ | 740 |
| 12 | 209¾ | 210 | 211¾ | 212 | 91½ | 91¾ | 91½ | 91¾ | 73 | 73½ | 72¾ | 73 | 738½ | 739 | 739 | 739½ |
| 13 | 207¾ | 208 | 210 | 210¼ | 91¼ | 91½ | 91¾ | 91½ | 73 | 73½ | 72½ | 72¾ | 736 | 736½ | 738½ | 739 |
| 14 | 208 | 208¼ | 210 | 210¼ | 91¼ | 91½ | 91¾ | 91½ | 73¾ | 73¾ | 73 | 73¼ | 737½ | 738 | 739½ | 740 |
| 15 | 213¼ | 213½ | 215 | 215½ | 93¼ | 93½ | 93½ | 93¾ | 75¼ | 75½ | 75 | 75¼ | 745½ | 746 | 745½ | 746 |
| 16 | 210¾ | 211¼ | 212¾ | 213 | 92½ | 92½ | 92¾ | 93 | 74¼ | 74¾ | 74¼ | 74½ | 743½ | 744 | 743½ | 744 |
| 19 | 212½ | 212¾ | 214¼ | 214½ | 93¼ | 93¾ | 93½ | 93¼ | 75¼ | 75¾ | 75¼ | 75½ | 744 | 744½ | 744 | 745 |
| 20 | 210 | 210½ | 211¼ | 211¾ | 93½ | 93½ | 93¼ | 93¾ | 75¾ | 76 | 75¾ | 76 | 742½ | 743 | 743½ | 744 |
| 21 | 209¾ | 210¼ | 210¾ | 211 | 93 | 93¼ | 93 | 93½ | 75¼ | 75½ | 75¼ | 75½ | 741½ | 742 | 743 | 743½ |
| 22 | 209¾ | 210 | 209¼ | 209½ | 92¾ | 93 | 92¾ | 93 | 74¾ | 74¾ | 74¾ | 74¾ | 740½ | 741 | 742½ | 743 |
| 23 | 206¾ | 207¼ | 207½ | 207¾ | 91½ | 91¾ | 91½ | 92 | 73¾ | 73½ | 73¾ | 73½ | 738½ | 739½ | 740½ | 741½ |
| 26 | 203½ | 204 | 205½ | 206 | 90½ | 90½ | 90¾ | 91 | 73 | 73½ | 73 | 73½ | 737 | 737½ | 739½ | 740 |
| 27 | 201½ | 201¾ | 203¾ | 204¼ | 90¼ | 90¾ | 90½ | 90¾ | 73¼ | 73¾ | 73 | 73½ | 735 | 735½ | 736½ | 737 |
| 28 | 203 | 203½ | 205 | 205½ | 90½ | 91 | 91 | 91¼ | 73½ | 73¾ | 73½ | 73¾ | 737 | 737½ | 738½ | 739 |
| 29 | 201½ | 201¾ | 204 | 204¼ | 89¾ | 90 | 91 | 91¼ | 73½ | 73¾ | 73½ | 73¾ | 735 | 735½ | 736½ | 737 |
| 30 | 202½ | 202¾ | 205 | 205¼ | 90 | 90¼ | 91¼ | 91¾ | 73¾ | 73½ | 73¾ | 73½ | 735 | 735½ | 736½ | 737½ |
| Av'g's | £208.613 | | £210.631 | | £91.726 | | £92.012 | | £73.893 | | £73.688 | | £740.036 | | £740.905 | |

Prices are for the official a.m. session in pounds sterling per ton of 2240 lb. Copper basis wire bars, lead 99.97%, zinc 98¾ and tin min. 99.75%.

# Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments f.o.b. New York unless otherwise stated, tons of 2,000 lb. unless otherwise noted. St—short ton; lt—long ton.

## MISCELLANEOUS METALS

August 31, 1957

| | | | |
|---|---|---|---|
| Aluminum ingot, 99 plus % lb. | | | 28.1¢ |
| Antimony, spot, lb. less than carload, in cases | | | 36.59¢ |
| In bulk, carload lots, f.o.b. Laredo | | | 33.00¢ |
| Bismuth, ton lots, lb. | | | $2.25 |
| Cadmium, commercial sticks, delivered, lb. | | | $1.70 |
| Calcium, lb. ton lots, 98%, cast | | | $2.05 |
| Chromium, 97% grade, lb. contract del. | | | $1.29 |
| Cobalt, 97 to 99%, per lb. eff. Feb. 1, 1957 | | | $2.00 |
| Germanium, per gram, 10,000 gram lots | | (c)38¢@ | (d)45½¢ |
| Indium, troy oz. | | | $2.25 |
| Lithium, lb. 98% | | $11.00 @ | $14.00 |
| Nickel, cathodes, lb. (a) | | | 74¢ |
| Other sales, reg. sellers | | 88½¢ @ | $1.05 |
| Sales by dealers, etc. | | | $1.05 |
| Magnesium, 99.8% carloads, lb. producer's plants, Velasco, Texas, eff. Apr. 16 | | | 35½¢ |
| Palladium, troy oz. | | $21.00 @ | $22.50 |
| Platinum (wholesale lots), troy oz. | | $81 @ | $87 |
| Quicksilver, flask of 76 lb., 25 flasks or more | | $250 @ | $253 |
| Selenium, 99 plus %, lb. (May 28, 1957) | | | $10.50 |
| Silicon, minimum 97%, carloads, lb. | | | 20¢ |
| Semi-Conductor grade, lb. | | | $350 |
| Tellurium, lb. | | | $1.65 |
| Thallium, 100 lb. or more, lb. | | | $12.50 |
| Titanium, 99.3 plus, grade A-1, max. 3% iron, lb. | | | (b)$2.25 |

(a) Eff. Dec. 6, 1956; incl. U. S. duty; (b) Effective June 3, 1957.
(c) Delivered; (d) f.o.b. plant

## METALLIC ORES

| | | | |
|---|---|---|---|
| Beryllium Ore, imported, 10% BeO, per short ton unit | | $36.00 @ | $37.00 |
| Chrome Ore per long ton, f.o.b. cars Atl. ports, dry: | | | |
| 44% $Cr_2O_3$ no ratio | | $30 @ | $30.50 |
| 48% $Cr_2O_3$ 3 to 1 ratio | | $52 @ | $58.00 |
| Iron Ore, Lake Superior, Lower Lake ports, long ton: | | | |
| Old Range bessemer | | | $11.85(e) |
| Mesabi bessemer | | | $11.60(e) |
| Mesabi, non-bessemer | | | $11.45(e) |
| Lead (Galena), 80%, Joplin, Mo., ton | | | $170.52 |
| Manganese Ore—Per long ton unit of Mn basis 48% manganese, nearby positions, subject to premiums and penalties, c.i.f. U. S. ports, import duty extra, export duty included, $1.40 @ $1.43; both duties excluded, $1.265 @ $1.295. Long-term contract nominal. | | | |
| Molybdenum Ore, 90%, per lb. of Mo f.o.b. mines | | $1.18 @ | $1.23 |
| Columbium-Tantalum, per lb., combined oxides 10 to 1 ratio | | $1.35 @ | $1.40 |
| Tungsten Ore, per unit of $WO_3$: | | | |
| Foreign 60%, c.i.f. U. S. ports, duty extra | | $12.75 @ | $14.25 |
| U. S. mined concentrate, per stu. f.o.b. mill (GSA price) (Suspended) | | | $55 |
| Vanadium Ore, per lb. of contained $V_2O_5$ f.o.b. mines | | | 31¢ |
| Zinc Ore, Prime, 60% concentrate, Joplin, Mo., per ton | | | $56 |

(a) Nominal.
(e) Eff. 1957 shipping season.

## METALLIC COMPOUNDS

| | | | |
|---|---|---|---|
| Arsenous Oxide (arsenic trioxide) lb., in bbl. carload lots delivered | | | 5¼¢ |
| Cobalt Oxide, 72½% to 73½%, per lb. eff. Dec. 1, '56 | | $1.52 @ | $1.55 |
| Copper Sulphate, 100 lb. eff. Oct. 25, '56 | | | $13.90 |
| Germanium Oxide, gram | | | 27½¢ |
| Molybdic trioxide, technical, per lb of Mo | | $1.38 @ | $1.41 |

## ALLOYS

| | | | |
|---|---|---|---|
| Ferrochrome 65 to 70%, per lb. of Cr. (4-9% C) | | | 27¾¢ |
| Ferromanganese, 74 to 76%, per lb., shipg. pt. | | | 12¾¢ |
| Ferromolybdenum, 58 to 64% Mo, lb. of Mo contained | | $1.68 @ | $1.74 |
| Ferrosilicon, 50% per lb. of Si f.o.b. shipping point (3-19-57) | | | 13¢ |
| Ferrotungsten, 72 to 82%, lb. of W contained | | | $2.60 |
| Ferrovanadium, per lb. of V delivered | | $3.20 @ | $3.40 |
| Silicomanganese, max. 1½% carbon, lb., contracts | | | 12.8¢ |
| Spiegeleisen, per long ton, 19 @ 21% grade eff. Jan. 7 | | | $102.50 |

## NON-METALLIC MINERALS

| | | | |
|---|---|---|---|
| Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds) ton: | | | |
| Crude No. 1 | | $1,400 @ | $1,725 |
| Crude No. 2 | | $750 @ | $1,100 |
| Spinning fibers | | $350 @ | $650 |
| Shingle fibers | | $190 @ | $210 |
| Paper stock | | $114 @ | $137 |
| Waste | | $82 @ | $84 |
| Shorts | | $28 @ | $75 |
| Asbestos, f.o.b., Vancouver, B. C. (U. S. funds): | | | |
| Spinning fibers | | $470 @ | $750 |
| Shingle fibers, effective Jan. 1 | | $210 @ | $310 |
| Asbestos, Vermont, f.o.b. Hyde Park: | | | |
| Spinning fibers | | $353 @ | $383 |
| Shingle stock | | $172 @ | $190 |
| Paper stock | | $114 @ | $145 |
| Waste, stucco or plaster | | | $82 |
| Refuse or Shorts | | $39 @ | $72 |
| Barytes f.o.b. cars: | | | |
| Georgia, crude, per ton | | | $18 |
| Missouri, 94% $BaSO_4$, per short ton | | $16 @ | $18 |
| Crude oil well grade, min. 4.3% sp. gravity, st (a) | | | $18 |
| Imported, c.i.f. Gulf Ports, st | | $16 @ | $18 |
| Bauxite, long ton, f.o.b. point of shipment: | | | |
| Domestic, crude, 50 to 52% (not dried) | (a) | $ 5.00 @ | $5.50 |
| Domestic, chemical, 55 to 58% | (a) | $ 8.50 @ | $9.05 |
| Domestic, abrasive, 80 to 84% | (a) | $18.00 @ | $18.50 |
| Imported metallurgical, per lt, f.o.b. Br. Guiana, dep. on grade | | | $7.14 |
| Feldspar, bulk, ton: | | | |
| Potash or soda feldspar, 200 mesh, ceramic grade | | $18.50 @ | $22.50 |
| Glass feldspar, white, 20 mesh | | $11.75 @ | $12.50 |
| Fluorspar, f.o.b. mines, bulk, 72½% effective, ton | | $33 @ | $41 |
| 60% effective $CaF_2$ | | $30 @ | $36.50 |
| Acid 97% concentrate, bulk, ton (eff. 12-1-56) | | | $50.00 |
| Some sellers quote | | | $55 |
| Fuller's earth, f.o.b. Georgia or Florida, ton | | $7.00 @ | $14.00 |
| Magnesite, per ton dead-burned, bulk, f.o.b. Washington | | | $46 |
| Mica—Domestic, f.o.b. mines. Punch 7¢ to 12¢ per lb. according to size and quality. Sheet clear, 1½ x 2-inch, 70¢ to $1.10; 2 x 2-inch, $1.10 to $1.60; 2 x 3-inch, $1.60 @ $2.10; 3 x 3-inch, $1.80 @ $2.30; 3 x 4-inch, $2.00 @ $2.60; 3 x 5-inch, $2.60 @ $3.00; 4 x 6-inch, $2.75 @ $4.00; 6 x 8-inch, $4.00 @ $8.00. Wet ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton. Scrap, $25 and up. | | | |
| Ocher, Georgia, ton, in sacks | | $26.50 @ | $32.00 |
| Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports | | | Not quoted |
| Sulphur, per lt, f.o.b. U. S. mines: bright | | | $26.50 |
| dark | | | $25.50 |
| Mexican, for use in Mexico, per metric ton, f.o.b. mines, 280 to 395 pesos, depending on use | | $22.40 @ | $31.60 |
| For export f.o.b. vessel, dep. on grade | | $24 @ | $26 |
| Talc, f.o.b. works, ton: | | | |
| New York, purified | | $18.00 @ | $20.00 |
| Vermont, extra white | | | $12.50 |
| Tripoli, Missouri, ton: | | | |
| 40-mesh, cream colored | | | $50.00 |

(a) Some restricted sales at $11.50. (b) Corrected.

## IRON AND STEEL

| | | | |
|---|---|---|---|
| Pig Iron, gross ton, basic, Valley Furnaces | | | $67.00 |
| Steel, f.o.b. Pittsburgh, billets, net ton | | | $77.50 |
| Structural shapes, Pa., Ala., etc., 100 lb. | | $5.10 @ | $5.275 |

# THIS MONTH IN MINING

## Iron Ranges Note Beneficiation's 50th Year

MAJOR MINING COMPANIES of the Mesabi and Cuyuna ranges are this year celebrating the 50th anniversary of iron-ore beneficiation. And with good reason, for since 1907, 450-million tons of concentrates have been shipped from the region—using ore which once was considered waste material. Today, 80 beneficiation plants employ 9,000 workers and form the backbone of Minnesota's iron-ore industry.

Mesabi and Cuyuna deposits are of three general types: direct shipping ore; natural partially concentrated ore; and unaltered taconite. At first, abundance of direct shipping ore made mining of the lower grades uneconomical. But mining officials saw that exploiting the full potential of the ranges required their use. And in 1907 the first experimental concentrating plant was opened on Trout Lake near Coleraine, Minn., by Oliver Iron Mining Co., now a division of U. S. Steel Corp. Although its success has led to continued growth of iron ore processing, declining reserves of direct shipping ore has also been a factor.

While the first Trout Lake concentrator merely treated the best of the middle type of ore, this year will witness the completion of Erie Mining Co.'s project, which is the third huge complex plant for making a commercial product out of raw unaltered taconite. Even though this may seem to be the ultimate step in iron ore processing, many schemes for concentrating the various grades remain to be tested and new ones devised. This research, as well as improvements and extensions of existing processes, figure large in the plans of Minnesota's iron ore companies—plans which require large financial investments that will affect the state's economy for many years to come.

About 40% of ore shipped from Minnesota is beneficiated, two-thirds of which is simply "washed." This sizing process is used when silica waste in the ore is in fine grains and iron mineral in coarse. The fines are washed off the coarse, using wet screens, trommels, log washers, classifiers and similar units. Concentration ratio is about 2:1.

"Retreat" ore requires more treatment than "wash" ore because it contains silica and iron minerals in same-size particles. On this ore, higher specific gravity of the iron minerals permits separation. In original Trout Lake plant, tables were used. Jigs came into use also. Most recently, Humphrey spirals and heavy media vessels using ferrosilicon have been applied.

Taconite now being treated contains magnetic iron mineral and, when finely ground to liberate silica, is concentrated by magnetic separators. Fineness of product requires sintering, nodulizing or pelletizing for blast furnace use. Nonmagnetic taconite is not commercial as yet, since it needs a roast to convert it to magnetic iron for concentration or needs to be concentrated by flotation, both rather costly.

Flotation is coming into use though, for this year also marks completion of the first such commercial plant on the Mesabi. It is Jones & Laughlin's Hill Annex tailings reclamation plant.

To mark this fiftieth year of progress the industry made Aug. 14 and 15 an "open house" at 22 concentrators spread along both ranges. And at the original Trout Lake site a stone monument was unveiled as a tribute to beneficiation's pioneers. Participating companies were: Cleveland-Cliffs; Haley-Young; M. A. Hanna; Jones & Laughlin; W. S. Moore; Oliver; Pacific Isle; Picklands Mather; Rhude & Fryberger; and Snyder.

## Program Announced For Rocky Mountain Sessions

DENVER WILL PLAY HOST to the 1957 Rocky Mountain Minerals Conference, Oct. 30-Nov. 1. Morning and afternoon business meetings will include addresses by leading mining representatives.

**Wednesday afternoon,** Technical Sessions No. 1: Milling Practice on the Mesabi Range by Earl C. Herkenhoff, Utah Const. Co.; Shaft Sinking at Homestake by Wm. C. Campbell, assistant mine superintendent; Sampling at Rio de Oro by J. G. St. Claire, consulting geologist; Ground Water in Colorado by T. G. McLaughlin, USGS, Federal Center, Denver.

**Thursday morning,** Technical Sessions No. 2: Metallurgy of Columbium and Tantalum by Sherman May, USBM, Albany, Ore; Tunneling by T. F. Adams, Blue River Constructors, Denver; Recent Developments, Exploration Activities of the Cerro de Pasco Corp. by F. N. Spencer, Jr., resident engineer, Cerro de Pasco Corp.; Magma's Limestone Replacement Orebody by R. N. Webster, chief geologist, Magma Copper Co., Superior, Ariz.

**Thursday afternoon,** Technical Sessions No. 3: Pima Milling Operations, G. A. Komadina, Pima Mining Co., Tucson, Ariz; Hydraulic Backfilling, R. M. Stewart, assistant to director of mining research, Anaconda Co., Butte, Mont.; Survey of Electromagnetic Prospecting Methods by G. R. Rogers, senior geophysicist, Bear Creek Mining Co., Denver; Status of Copper Mining in Southern Arizona by H. A. Schmitt, mining geologist, Silver City, N. M.

**Friday morning,** Technical Sessions No. 4: Milling Practice of American Chrome Co. by W. H. Hisle, mill superintendent American Chrome Co., Nye, Mont. Recent Trends in Mining Machinery Development by Prof. C. C. Frush, Colorado School of Mines, Golden, Colo.; Orphan Mine-Grand Canyon, Ariz. by M. E. Kofford, chief geologist, Golden Crown Mining Co.

**Friday Afternoon,** Technical Sessions No. 5: Panel-Uranium Mining and Geology; Panel-Uranium Metallurgy. Dinners, cocktail party, and other "cultural activities" have been planned for the pleasant evening hours, E. H. Crabtree, general chairman, announced.

## DMEA Loan Is Granted to Geochemical-Found Mine

DEFENSE MINERALS EXPLORATION ADMINISTRATION announced a $45,960 initial grant to Geo-Resources Corp., of Spokane, Wash., to cover a search for uranium in the Blue Mountain area of eastern Washington. Previous prospecting with conventional bulldozer and scintillometer equipment failed to disclose anything attractive in this area. Subsequently, a new technique called "the alluvial geochemical method" was applied. William Weaver, president of Geo-Resources, said that results of Blue Mountain tests with the new geochemical technique have indicated presence of substantial uranium deposits buried along a granite-argillite contact which is the zone of uranium localization in other producing properties in eastern Washington.

Alluvial geochemical surveying is based upon the principle that underground water seepage carries traces of valuable minerals into adjacent streams and gullies. Samples of alluvial soil taken from seepage areas are tested geochemically for traces of uranium. By skillful correlation of such factors as the geologic setting, elevation and position of rock formations and underground water tables, geophysicists are able to determine the location of nearby uranium deposits.

## USBM Reports on Cuban Laterite Smelting Tests

CERTAIN CUBAN NICKEL ORES, (See p82) as shown by electric smelting tests conducted by the Bureau of Mines, will yield a low-carbon ferronickel product suitable for use in steel mills. Announcement was made by the Department of Interior in a report describing research work conducted at Bureau's Electrodevelopment Experiment Station, Albany, Ore., under a cooperative agreement with the General Services Administration.

Cuban serpentine and laterite nickel ore were reduced in Bureau's electric furnace on a continuous basis. Reducing agents were bagasse (juiceless sugar cane stalks) and bagasse-coke mixtures. Bagasse reportedly is available in considerable quantities in Cuba.

Bureau report, R. I. 5346, "Electric Smelting of Cuban Serpentine and Laterite Nickel Ores," written by Wallace E.

Anable and Lloyd H. Banning, can be obtained by writing the Publications Section, Bureau of Mines, 4800 Forbes Street, Pittsburgh 13, Pa.

## Sentinels of Safety Awarded by Interior

DEPARTMENT OF INTERIOR has announced winners of the annual "Sentinels of Safety" awards for the best safety records in mine and quarry groups during the 32nd National Safety competition.

Bronze "Sentinels," awarded by *Explosives Engineer* magazine, will be received in the following categories:

Metal mines (underground): Buck iron ore mine, Pickands Mather & Co. (Verona Mining Co.), Caspian, Mich. 493,207 man-hours without a disabling injury. The Buck also won the trophy in 1952.

Nonmetallic mines (underground): Bell limestone mine, Warner Co., Bellefonte, Pa. Also a winner in the 1955 contest.

Open pit mines: Embarrass iron-ore mine, PM&Co. (Lake Mining Co.; Biwabik, Minn. 505,932 man-hours without a disabling injury won the trophy for the third time.

## Mining Calendar

**American Mining Congress,** 1957 Metal Mining and Industrial Metals Convention, Salt Lake City. Sept. 9-12

**International Mineral Dressing Congress,** Stockholm, Sweden. Sept. 18-21

**Exploration Drilling Symposium,** University of Minnesota, Minneapolis, Minn. Oct. 3-5

**4th National Symposium on Vacuum Technology,** Boston. Oct. 9-11

**AIME and ASME Joint Solid Fuels Conference,** Quebec City. Oct. 10-11

**Society of Mining Engineers** annual meeting and Southeastern States Mining Conference, AIME. Hotel Hillsboro and Hotel Tampa Terrace, Tampa Fla. Oct. 15-18

**Professional Engineers of Oregon,** state convention, Eugene, Ore. Oct. 18-19

**45th Annual National Safety Congress and Exposition,** Chicago, Ill. Oct. 21-25

**International Atom Week,** sponsored by Atomic Industrial Forum and American Nuclear Society, New York City, Oct. 28—Nov. 1

**Rocky Mountain Minerals Conference,** AIME, Denver, Colo. Oct. 30-Nov. 1

**American Society for Metals,** second world metallurgical congress, Chicago, Ill. Nov. 2-8

**International Mining Days '57 and 1957 Annual Meeting of New Mexico Mining Association,** El Paso, Texas. Nov. 7-9

**Institute of Metals,** (London) inaugural meeting of powder metallurgy group. Church House, London. Dec. 4

# *As We Went to Press . . .*

**Brazil is moving fast** to get its iron ore exports moving. Advisors have told the government that the nation could be exporting 20- to 30-million tons per year and President Juscelino Kubitschek's administration has formed Grupo de Exportacao de Mineiros de Ferro to cut red tape.

GEMF is expected to "serve as a catalyst" in bringing foreign and local industry into Brazilian mining. The group's board is composed of officials of every single government department which would have to approve foreign investment. If GEMF gives the nod, a foreign mining company is "virtually assured" quick, red-tapeless action.

Two U. S. companies in Brazil for which GEMF has hopes are Bethlehem Steel, already at Amapa and looking around Minas Gerais, and M. A. Hanna, also exploring in the area around St. John del Rey.

Right now, Brazil exports less than 3-million tons of iron ore annually, mostly from Vale do Rio Doce.

**Some 20% more nickel for U. S. supply will be coming** in mid-1959 from Cuban American Nickel Co.'s planned refinery at Port Nickel, south of New Orleans. The Freeport Sulphur Co. subsidiary will refine ores from Cuba (see pp 78 and 82, this issue). Freeport obtained financing for the project from banks and large nickel consumers. Scheduled capacity will be 50-million lb nickel and 4.4-million lb cobalt annually. Total cost is estimated at $119-million and $8.5-million has already been spent.

**A large and rich bauxite deposit** in Surinam is being tapped by Billiton Maatschappij. Company plans involve draining the swampy area above the deposit and then removing 15 to 35 meters of clay, sand and peat overburden. A bucket wheel will excavate overburden and load onto Hewitt-Robins conveyors for the two-mile trip to the dumps. Ore will be shipped by rail to the Surinam River for drying and shipment to Gulf Coast and Canadian ports.

**Half-year production of uranium concentrate** from the 12 western mills was 4,141 tons, according to AEC. Some 1.6-million tons of .28% ore were processed at an over-all rate of 9,600 tpd. Grand Junction Operations Office also estimated U. S. reserves at 67-million tons, averaging .27 $U_3O_8$.

**International Finance Corp.** (*E&MJ*, July 1957, p 120) **is** reportedly negotiating a $2.2-million participation in a $12.8-million copper property in Chile. Loan to an unnamed private company would permit production of 25-million lb per year of refined copper.

**Metal producers are showing mixed emotions** on news from Detroit that: 1. an approximate 6.5-million car-sales plateau can be expected in 1958; 2. that the new Ford Motor Co. Edsel uses almost 50 lb aluminum per car; 3. that Chrysler still feels the automotive turbine will be here by 1956, and perhaps "much earlier"; and 4. that a "scrubber" for autos (to answer smog-making charges) would use vanadium pentoxide as a catalyst. The latter, said to be two years away, is "seriously handicapped" in efficiency by tetraethyl lead in the gasoline.

# Behind the By-Lines...

G. P. Lutjen

**Assignments in the Caribbean** are just about the finest thing that can happen to an *E&MJ* editor and it is with outright sorrow that we turn in our set of matched maracas, our swivel-necked rum tester and our calypso handbook. The last odyssey took in Haiti, Cuba, and Jamaica in that order.

While the general air of Paradise Regained pervades all these islands, the atmosphere of each is completely different. Haiti was settled by the French. The official language is French, although 95% of the people speak a patois, and the frilly ironwork and balconies are right out of Old France or maybe the Vieux Carre in New Orleans. Cuba is steeped in the Spanish traditions, from language to politics. Even the startling and wonderful things they are doing architecturally with concrete are unmistakably Cuban. Jamaica is British and, except for the exotic foliage, the stone walls lining the country roads and the Tudor architecture are fugitives from a Thomas Hardy novel.

**In Haiti** we had fully intended to update *E&MJ* readers on voodoo technology. Unfortunately this important activity was being neglected in favor of political pelota, a strenuous pastime involving strikes, indiscriminate throwing of rocks and the chasing of cars bearing *E&MJ* editors. Romping around a country that has no government can be very unsettling. For instance, flying in from Miragoane, the site of Reynolds Haitian Mines' operations, there was nobody minding the store at the international airport in Port-Au-Prince. Instead of the usual garbled chatter back and forth between tower and pilot, there was nothing but ungarbled silence.

As with air travel, all ships to and from anywhere were cancelled. Neither mails nor cable nor telephones functioned. Banks were closed and tourists were nervous.

We would have been nervous, too, only Jack Ryan, Reynolds' manager, was kind enough to have the company pilot, Henry Wiener, fly us to Santiago. Happily, despite a bumper load of souvenir postcards we were hauling, the flight was without incident except that the door opened halfway across the sea.

Before bidding farewell to the sorely troubled Republic, we came across one Haitian institution that bears studying; the Rah-Rah. This appears to be a device employed by fun-loving country folks to extend parties beyond the normal limits of endurance. Certain elements of the citizenry are given to getting bombed of a Saturday night on low-cost, do-it-yourself rum. Along about Sunday afternoon all are revived by the staging of an impromptu parade. The group leader paints himself blue or gets duded up in a shroud or something equally distinctive. Then the whole crew starts down the road accompanied by their own catch-as-catch-can musical instruments, some pretty wild chanting, a number of half-full jugs and unbounded hilarity. With a few refinements the Rah-Rah might replace the Scotch Breakfast at AIME meetings.

**In Cuba,** all was not serene, at least not around Santiago. We hadn't seen as many soldiers in one place since our last USO dance. It seems that a group of rebels was cutting up a few touches in the hills and with rumors of an invasion force lying off the coast, our entry via small plane was viewed with a great deal of suspicion by one and all.

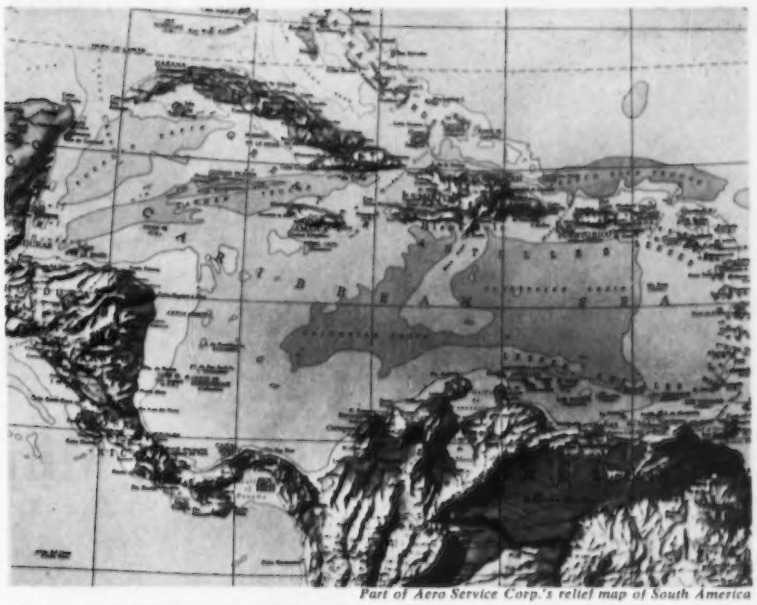
While visiting the Pearl of the Antilles, there was a good deal of nonsense about seeing plants and mines, which we sandwiched in among other activities such as: a flight in Moa Bay Mining Co.'s slick new Aero-Commander (according to company officials there is no significance in the fact that the names of the pilot and copilot are, respectively, Caesar and Napoleon); an evening-long rhumba lesson at the Club Nicaro; at Matahambre, the most fabulous deep-sea fishing ever encountered; and Havana! When it comes to cities, Havana and San Francisco lead all the rest.

**In Jamaica,** people are given to driving on the left hand side of the road and it gave us quite a turn for the first few miles. Chief sources of income seem to be tourists and bauxite. Although the island is absolutely beautiful, its chief attraction is the warm easy-going hospitality. (One evening they let us win a few shillings at bridge; with the kind of bridge we play, this is about as far as you can go in hospitality.)

The close of our stay in Jamaica was marred by an incident which might have spoiled the whole trip for a less hardy traveler. When we checked into the airport at Montego Bay we found the plane to New Orleans would be a few hours late. As per charming custom, the airline offered to buy our lunch at whatever hostelry we desired. Our selection of the Half Moon was based largely on the awe we remembered in the voices of our well-heeled friends who had put in any time at the place. Indeed, after a few hours at this incredibly lovely spot, we were pretty awful too.

In short, the plane was 24 hours late, ruining all our well-laid plans. Nevertheless we kept a stiff upper lip, bravely wallowing in the luxury of a $50-a-day room, idly wondering what similar tabs for 50 or 60 other passengers would do to the airline's profit and loss statement. After a while, we felt so badly about it that we gave up sticking pins in a little model plane, a trick we had picked up in Haiti.

**Reports on mining activities** in the Caribbean are scattered over the next few pages. We think you'll agree that opportunities for mining men surpass even those for beachcombers.



*Part of Aero Service Corp.'s relief map of South America*

**THREE ISLANDS**—Cuba, Haiti and Jamaica—make up only a small fraction of mining's newest province, yet over $500-million will be invested here alone by 1960.

# The Caribbean— Mining's Newest Province

ONCE MORE the fabled Spanish Main has become the source of treasures so vast they tax the imagination. This time it's not gold, silver and platinum for the coffers of kings, but aluminum, nickel, iron, sulphur, manganese, and copper for the sinews of industry. In the Caribbean, springing up almost overnight, is the Free World's newest mining province.

"Startling" is the only way to describe its growth. Incredibly, the last five years have seen the start of production in mines and plants capable of producing annually:

15-million tons of iron ore
50-million lb of nickel
5-million lb of cobalt
2-million tons of bauxite
500,000 tons of sulphur

Even these figures don't give the complete picture. In nickel for example, the annual capacity of 50-million lb will be 80-million by 1960, and in all probability, more than 110-million lb by 1962. There will be a proportional increase in cobalt output. Further, nickel producing plants in the Caribbean are storing tailings that run high in iron. Metallurgical research one day will come up with a method of separating the chrome and manganese impurities from the iron to produce another marketable product.

In bauxite, the figures don't reflect that one company is processing the ore to alumina. Alumina production is 1,350 tons per day and present expansion plans call for the same company to build another plant to add 50% more capacity.

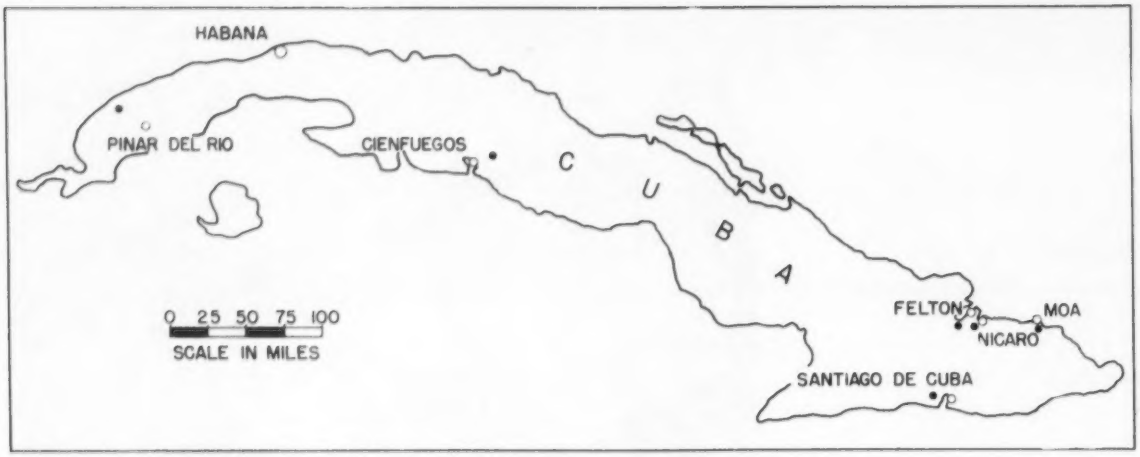
Not included in the figures is production of minerals which have long been mined in the area; copper, manganese, chrome. There is no accurate measure available of the output of these commodities, but even moderate success in current exploration activities could well give the statistics on these minerals, the same incredible jump shown by nickel, bauxite, iron and sulphur.

Another approach to the picture of Caribbean mining is a look at the capital invested. A conservative estimate puts the figure at $275-million. Present plans and new construction will raise investment to about $375-million by 1960, and chances are that by 1962, $500-million will be the more accurate investment figure.

There are two reasons why this issue had to be published. First of all a brand new mineral province is coming to life. In the second place, the job that progressive mining companies and the national governments are doing should be put on the record.

In the space available however, it would be impossible to do justice to the entire Caribbean. We have therefore narrowed our focus to three islands where we have an opportunity to examine the factors that are making for growth everywhere in this new mining province, and where the technical developments have particular significance.

In no way do we wish to write off other developments in the Caribbean, especially the 10-million tons of iron ore produced annually in Venezuela, or the 500,000-ton sulphur output from the isthmus of Tehuantepec in Mexico. These are important parts of the over-all picture. But right now, let's take a look at Cuba, Haiti and Jamaica and their growing contributions to the Free World's economy.




# Cuba and Its Stake in Mining

THE "PEARL OF THE ANTILLES" is in many ways the most spectacular of the mining countries in the Caribbean. Not only does it have seemingly limitless deposits of nickel and iron-bearing laterites, but hard rock mining as well, and much ground to be explored.

Extraction of nickel from Cuba's laterites will reach 100-million lb per year when present expansion at the $90-million U. S. Government-owned Nicaro plant (see p 82) and new production at the $35-million plant at Moa Bay (see p 78) come on stream.

A third nickel plant may soon follow. Bethlehem Steel, with an estimated 500-million tons of laterite (not all nickel-bearing) is negotiating with the U. S. Government to build a 30-million-lb plant.

Copper and manganese share the spotlight in hard rock mining and on the ensuing pages we have notes on representatives of each of these fields. Here is a brief round-up of other activities.

**Charco Redondo** manganese mine in Oriente Province is now producing about 300,000 tons a year of 42% Mn ore. Nearly 2-million tons of ore have been produced from this mine and possibly that much more remains.

**Cayoguan chrome mine** in Oriente, 10 miles east of Moa, has produced over a million tons of refractory grade ore to date. Present production rate is about 50,000 tons a year, but the mine is practically worked out.

**Margot pyrite mine** in Matanzas has produced some 250,000 tons from an open pit. Present production is about 200 tpd and it is understood that they are planning to go underground on an extension of the orebody.

**Francisco copper mine** in Pinar del Rio is putting 100 tpd through a small flotation plant.

There are numerous manganese mines and two other small chrome mines being worked in Oriente. In the San Fernando area near Cienfuegos, in Las Villas, Dr. E. Romagosa (Matahambre) has some small copper operations.

**TODAY** jigging and hand sorting produce a high grade concentrate from old surface workings.

**TOMORROW** deposit may be mined by block caving if drilling program reveals enough low-grade ore.

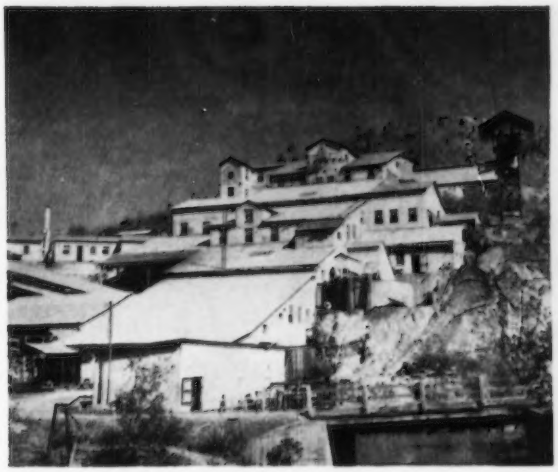
## El Cobre—450-Year Old Prospect

MINED BY THE SPANIARDS in the early 16th century and possibly before that by Indians, El Cobre is now being prospected at depth by the Moa Bay Mining Co., subsidiary of Freeport Sulphur Co. The fabulous old mine, 8 mi northwest of Santiago, lies in a badly faulted area 2,500 ft long and 800 ft wide.

Six 1500-ft diamond drill holes are planned to intersect the formation below the estimated bottom of the old workings. Tough drilling will be further complicated by the lack of mine maps and by the extensive subsidence.

At present a local contractor has a small crew high grading near surface pockets and pillars. Hand cobbing and a jig concentrate provide a product that runs as high as 24% copper.

This rich material, however, is not Moa Bay Mining's target. What they hope to find at depth is a continuous, high-tonnage, low-grade orebody which lends itself to large-scale mining operations, perhaps block caving. Moa Bay should know by 1958.



**MILL** has 1,100 tpd capacity, produces a 32% concentrate from heads that run 6% copper; recovery is 98%.

**LOADING** of ships at subport of Santa Lucia is done by lighter. Aerial tramway brings ore six miles from mine.

**DR. ROMAGOSA,** Matahambre president; Arthur Nelson, general manager; R. A. Bradley, geologist; Robert McGrantham, chief geologist; J. P. Elwell, mine supt.

**MILL SUPT.** Umberto Alisius and metallurgist William Martinez.

# Matahambre-Cuba's Largest Cu Mine

CHIEF PROBLEM at Minas de Matahambre some 15 miles northwest of the town of Pinar del Rio in Western Cuba, is the lack of sizeable ore reserves, and steady probing for ore with diamond drills is a standard part of the operation. The situation is not new for the company or its genial president, Dr. Ernesto Romagosa. Only 13 years ago experts had written the Matahambre off as being worked out. Dr. Romagosa and his Cuban associates had the courage to back their personal convictions about the mine's future and bought out the American interests.

Shortly thereafter, a large block of ore was found on the 3200 level. This was the "44 Orebody" and it has kept the mine in business since. Production was sustained for a long time at 1,000- to 1,100 tpd but has recently been curtailed to about 700 tpd.

Ore zones at Matahambre lie between, under, and sometimes in, members of four fault systems. The zones are tubular or pipelike, each containing many shoots occurring as vein segments, lenses and wedges. Major ore zones are elongated vertically, and converging at depth, plunge generally toward the northwest. If patterns encountered in the upper workings are repeated below, Dr. Romagosa and his geologists are optimistic that they will hit another sizeable orebody.

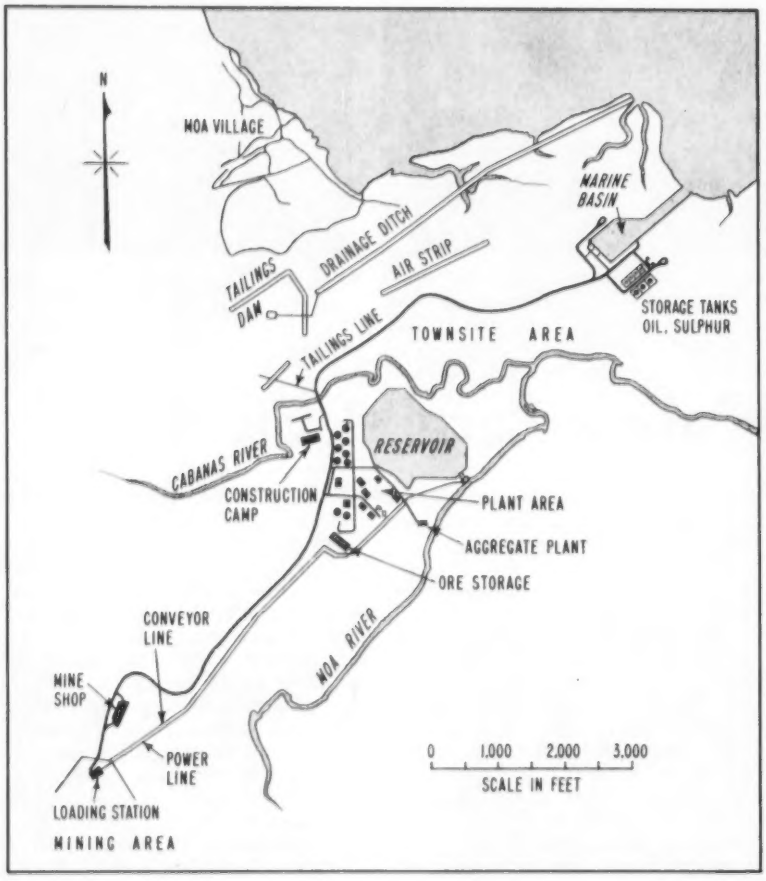
Matahambre uses both square set and cut and fill mining methods. Old stopes are backfilled with tailings. Mill heads run 6% and the orthodox flotation plant produces a 32% concentrate with a 98% recovery. Tails run about 0.14% copper.

Copper concentrate is moved to the subport of Santa Lucia about 6 miles away, over a bi-cable aerial tramway.

Along with the main ore mineral, chalcopyrite, there is considerable pyrite and Matahambre is giving serious consideration to construction of a sulphuric acid plant at Santa Lucia.

**GENERAL SUPERINTENDENT** Jack Schisler studies plans with Bal Darnell, Santiago office head, and Dick Colligan, vice president.

# Planning Cuba's Second Nickel Mine




**←PIPELINE** may replace conveyor in final plans for Moa Bay.

WHAT COULD BE an almost ideal mining operation, producing some 50-million lb of nickel and 4.5-million lb of cobalt annually, is taking shape at Moa Bay on the north coast of Cuba, 500 miles east of Havana, where Moa Bay Mining Co., a subsidiary of Freeport Sulphur Co., is getting ready to mine 50-million tons of ore containing 1.35% nickel, 0.14% cobalt and 46.5% iron.

Plans call for mining at the rate of 6,000 tpd from the 8,000-acre holding and production of a nickel-cobalt concentrate for shipment to the Cuban American Nickel Co. (another Freeport subsidiary) plant at Port Nickel, La., for production of nickel and cobalt metals. This will be the first time that cobalt metal has been produced directly from Cuban ore.

What makes mining so ideal at Moa is the moderate climate, the presence of plenty of fresh water and the fact that the ore is found on terraces that slope gently from the 4,000-ft high Sierra de Moa to the south to the coastal plain to the north. The almost continuous orebody lies in an area about 3 miles wide and 2 miles deep, running roughly parallel to the coast 2 to 4 miles inland.

Pine growth between the elevations of 200 and 1,000 ft plainly marks the

ore. Above 1,000 ft and below 200 ft the growth consists of hardwoods.

Geology of the deposit is thoroughly described in an AIME paper* given by Dick Colligan, vice president of Moa Bay Mining Co. in charge of the Cuban operations. The following paragraph from that paper pinpoints a distinctive feature of the Moa nickel ore.

"Moa deposits differ from Nicaro chiefly in the ratio of lateritic iron ore to decomposed serpentine ore. In making the distinction between 'iron ore' and 'serpentine ore', an arbitrary cut-off of 35% Fe is used. At Nicaro this ratio is about 1.6:1 whereas at Moa the ratio is 10:1. Serpentine ore at Moa is nonexistent over a great part of the ore areas, and the lateritic ore lies on relatively hard, unweathered serpentine with a zone of transition usually less than a foot thick. Because of the irregular distribution of the decomposed serpentine (the only serpentine in which nickel is concentrated enough to be called ore) at Moa, no serpentine ore is included in the reserves."

## Sulphuric Acid Leach

Because there is little serpentine nickel ore, sulphuric acid can be used for leaching whereas at Nicaro the presence of serpentine ore with its high magnesium content makes use of sulphuric acid prohibitive. Secondly, the hard barren serpentine underlying the ore aids in mining.

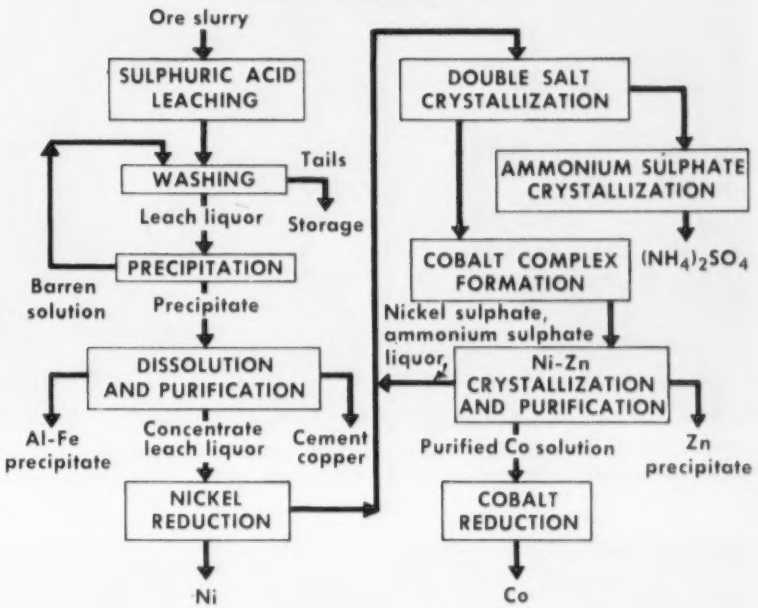
Average thickness of the orebody is 35 ft. but it varies from 8 to 80 ft. Ratio of overburden, in the form of lateritic iron, to ore is about 1:2. Present plans call for stripping with dragline and scrapers, the dragline doing the bulk of the stripping and the scrapers finishing off the last few feet.

Ore will be mined at the rate of 2.2-million dry tons a year with a 5½-day work week on a 2-shift basis. Draglines working from the top of benches into the pit will handle all the mining. A total of 7 draglines, of 5-yd, 3½-yd, 2½-yd sizes, all with perforated buckets, will be used in mining and stripping.

One problem faced in mining is the irregularity of the pit bottom. The underlying, fairly hard serpentine makes the mining cut-off easy to spot, but the sharp undulations and pinnacles will make some ore at the bottom inaccessible. Mining to a smooth bottom, if possible with the hard underlying bed, would take some of the serpentine knobs, but give higher mining recovery. This could cause complications because the high magnesium content of the serpentine would

*Not yet published

**CUBAN AMERICAN NICKEL CO.**
**BRAITHEWAITE, LA.**



**AUXILIARY BUILDINGS** for construction work will later serve mining operations.

**MARINE BASIN** was dredged out in advance for unloading of materials.

**PIONEERS** at Moa Bay are the engineers, draftsmen, mechanics already living in the camp overlooking the site of future operations. These men come from all over Cuba, are laying the groundwork for the new mine.

**HARD SERPENTINE** underlying the orebody poses a problem in mining. Sharp undulations like that above will make some ore inaccessible to dragline buckets.

raise consumption of acid used in later processing. It's possible, however, that screening would eliminate hard inclusions.

Tentatively, the entire orebody has been arbitrarily divided into three mining areas running east and west along the orebody (see map). These 5,000-ft wide areas will be mined one at a time.

In a given area, ore will be hauled to a central point where it will be slurried in log washers and screened to eliminate plus 4 mesh material. The slurry will then enter a pipeline and flow by gravity to large storage ponds in the plantsite area.

Haulage units to get the ore from dragline to slurry station have not been selected. Moa Bay engineers are planning to run competitive tests with trucks, Athey wagons and open scrapers.

The combination of a helpful topography, a hard, fairly impervious formation under the orebody and plenty of water available in the area, plus the fact that the ore would be slurried before processing, led to the selection of this novel ore transportation method. Solids content of the slurry will be kept at about 40%.

Sulphuric acid will do the leaching and the accompanying flowsheet shows as much as can be divulged about the processing at this time. The leaching, washing and precipitation steps on the flowsheet will be carried out in Cuba. Concentrate will be shipped to the U. S. as a slurry in the same barges that will bring liquid sulphur to Moa.

## High Iron Tailings

Concentrate for shipment to the U. S. will contain about 55% Ni and 5% Co while tailings are anticipated to run less than 0.1% Ni plus Co. Tails will also contain 47 to 48% Fe which will be stored for the future. This iron could be valuable if the 2 to 3% chrome present could be eliminated.

Sulphuric acid for leaching the ore will be made in Cuba from liquid sulphur shipped from Freeport's Louisiana sulphur mines. Coral limestone, obtained locally, will be used for neutralizing in the precipitation step.

This Cuban plant will ship a nickel-cobalt concentrate to the Cuban American Nickel Co. extraction plant at Port Nickel, La., where nickel and cobalt metals will be produced. In the case of cobalt, this will be the first production from Cuban ores (Nicaro plant produces a nickel oxide and a nickel-nickel oxide sinter). Hydrogen

**HAL KRISTJANSON** is assistant construction superintendent at Moa Bay.

**"BEFORE"** might well be the title of this picture of the town of Moa with its one television aerial and one hotel. Hold for comparison "after" mining starts.

will be used to reduce and precipitate.

In the face of the almost chronic nickel shortage in late years, a surprising number of obstacles have beset Moa's path. More than three years ago Freeport broke the story of its then estimated 40-million ton nickel orebody which looked amenable to a process tested by Freeport and Chemical Construction Co. Pilot work was favorable. Presumably Freeport was ready to move ahead but the question of financing came up.

## Piloting the Process

Freeport planned to finance the venture privately. Institutions with money available for this kind of project wanted some sort of guarantee—say a purchase agreement from the U. S. Government. The Government, hungry for nickel said yes but—"we want the process piloted full scale first."

This attitude is understandable when you recall that at the time, early 1954, several plants pioneering new chemical metallurgical processes were having their headaches. Nonetheless the pilot operation with full scale equipment delayed Moa development two years, and subsequent rises in material and construction costs increased the amount of money needed. Presumably, results of the full scale Government-financed pilot work eased people's minds and contributed to process technology, but if anything unforeseen or revolutionary resulted, no one has said anything about it.

With completion of pilot plant tests in December 1956, another 4 months were required before Freeport and the U. S. Government finally completed negotiations for purchase of the ore. Essentially this agreement calls for the Government to take by June 30, 1965, whatever nickel is offered up to a total of 271-million lb and whatever cobalt is offered up to 23,835,000 lb at the market prices prevailing at the time the contract was signed 74c for nickel and $2 for cobalt.

Meanwhile, back at Moa, time was not hanging too heavy on the hands of Moa Bay Mining Co. engineers. Ore had to be supplied for the 50-tpd pilot plant, sites had to be laid out, a harbor dredged and preparation made for construction.

## Two Years to Build

This work went ahead and a 400-million gal reservoir was prepared, water lines put in, barracks and cafeteria built for an expected 2,000 to 2,500 construction workers, and various shops erected. In fact everything has been done so that when contractors move in they can start on the 2-year construction with a minimum of confusion and without the usual delays involved when contractors have to take time to provide their own auxiliary and service facilities. Moreover, time was allowed for careful planning so that facilities for construction work could be located where they could be efficiently turned into permanent fixtures for the mining operation, thus saving time and money.

With all this out of the way—piloting through, purchase agreement reached, ground ready for the contractors—the last obstacle was Moa Bay's application for partial tax exemption under Decree 1038 of the Cuban government. Briefly, 1038 reduces taxes on a new industry for 10 years, which includes development time. This means 10 years of 18% taxes instead of 45%. The question is, "What is a *new* industry?"

Moa Bay Mining Co. feels that it qualifies as a new industry in Cuba. Although the U. S. Government plant at Nicaro has for some years produced a nickel oxide, Moa Bay Mining Co. will produce for the first time a nickel-cobalt sulphide concentrate. Production of this nickel-cobalt concentrate will mean that Cuba for the first time will become a source of cobalt. In fact, the size of the project will make Cuba the largest source of cobalt in the entire Western Hemisphere.

## Obtaining Nickel as Sulphide

Moreover, the nickel in the concentrate is in the form of a nickel sulphide which is entirely different, both physically and chemically, from any product heretofore produced in Cuba, and the process to be used is a completely new one never before employed in Cuba.

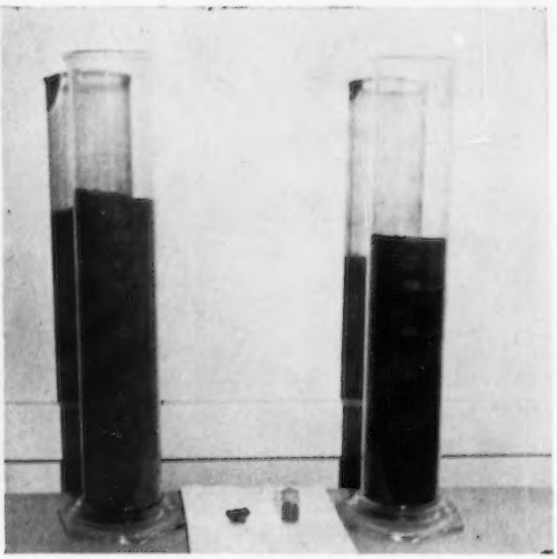
The National Economic Council of the Cuban government recommended that the Moa Bay project be designated a new industry and the official decree was expected to be issued momentarily.

With construction to start at once, Moa's first production should be available in 1959, adding substantially to the U. S. and world production of strategic nickel.

*E&MJ* would like to thank Moa Bay's staff for their many courtesies extended during our recent visit to the property and to the industry and Government officials who answered many questions which helped form this story.

**Welcome to Nicaro . . .**

**TOWNSITE** at Nicaro has all the facilities of a modern city anywhere from a ball park to modern hospital.



**. . . And Lateritic Nickel**

**EXTRACTING NICKEL** (center) from lateritic ore represented at left still leaves plenty of material for tailings (right).

# Nicaro Expands Nickel Capacity

EARLY THIS SUMMER, as new units came on stream one by one and construction crews packed their tools, production at the U. S. Government's expanded nickel plant at Nicaro in Oriente province, gradually climbed toward a production rate of 50-million lb of nickel a year.

The expansion project itself was a triumph of teamwork. Completed cost was $36-million, $7-million less than original estimates. (Total U. S. Government investment in Nicaro is now $85-million.) More than that, production at existing facilities climbed steadily throughout construction.

Such a feat rates enough praise to go all around: to the Nickel Processing Corp., National Lead Co. subsidiary, operating the plant; H. K. Ferguson Co., engineering subcontractor; Snare-Merritt, construction subcontractor, subsidiary of Frederick Snare Corp. and Merritt-Chapman & Scott Corp.; General Services Administration, who holds Government responsibility for Nicaro; and perhaps a lion's share of the credit is due to the Cuban plant and construction workers whose efforts really made the double-barrelled accomplishment possible.

Expansion at mine and plant was not entirely a simple matter of increasing the number of units of equipment. Materials not available during the original World War II construction have been introduced and the operating experience and research accrued in Nickel Processing's five years of operation have been brought to bear.

### What it Takes to Mine 7,000 tpd of Ni Ore

- 12 Draglines
  - 3 Marion 111M (diesel)
  - 2 Manitowocs (diesel)
  - 3 Bucyrus-Erie (diesel)
  - 2 Bucyrus-Erie 120B (electric)
  - 1 P&H (electric)
  - 1 Marion 40A (electric)
- 35 Caterpillar tractors
- 28 Euclid 22-ton trucks
- 11 Scrapers
  - 4 LaPlante Choate (14 yd)
  - 3 LeTourneau (23 yd)
  - 2 LeTourneau (15 yd)
  - 2 Caterpillar (11 yd)
- 10 Mobile drill units on Willys pickups (exploration)
- 9 Dodge power wagons
- 5 Chevrolet command cars
- 6 International 191 (dump and flat bed)
- 5 Chevrolet 2-ton
- 3 Motor graders
  - 1 Galion
  - 2 Adams
- 8 Jeep station wagons
- 7 Jeeps

## Mining

In expanding mine production from 120,000 dry tons per month (ore contains 30% moisture) to 210,000, more equipment was added and the present 11-mile railroad from mine to plant is being extended nine miles to tap other orebodies.

Full production will require some 180 to 200 major pieces of equipment, many of which are listed below. About 40% of this will be used in railroad construction until that phase of expansion is complete.

Bulk of the ore for the Nicaro plant to date has come from the Ocujal orebodies which consist of the hilltop remains of a blanket of lateritic iron deposits.* At the bottom of the laterite is a serpentine containing less than 0.2% nickel. Above this is a band of altered serpentine where removal of other constituents by solution has raised nickel content to 1.8%. Iron content averages about 12%. This zone varies in thickness and is apparently a transition between the serpentine below and limonite above.

Limonite is the result of removal of silica and magnesia. It assays approximately 50% iron, 6% silica, 1.25% nickel and 1.5% chromium. Cobalt content throughout all zones

*"How Cuban Nickel Ore Was Formed—A Lesson in Laterite Genesis," *E&MJ*, October 1955.

**The First Mine...**

**OCUJAL OREBODIES,** about 11 miles from the Nicaro plant, have supplied virtually all of the ore to date.

**...And a New Railroad**

**MINE OPERATION** is carefully controlled since draglines must blend limonite and serpentine ore for plant.

**NEW RAILROAD** is being extended 9 miles. In charge is Lloyd Stanley (r) talking here with foreman Juan Monclies.

**OBJECTIVE** of new rail line is the Ramona property, already crisscrossed with roads for prospect drilling.

of the deposit varies with nickel content, although no mineralogical relationship is apparent. Ni:Co ratio is about 10:1.

Nickel grade in the limonite increases with depth. In mining, the surface is stripped by scrapers to a cutoff grade of 1.1% nickel. Remaining limonite and altered serpentine are mined by draglines working from the top of the deposit. Not only are there variations in the grade from place to place in both limonite and altered serp, but both total and relative thicknesses of the two zones vary.

From such a deposit, the mine must supply a feed to the plant that averages out at about 1.37% nickel and 38% iron. If iron averages less than 35% of the ore, nickel content must be higher than the 1.37% for efficient metallurgy. To hit this target requires careful control of mining; frequent sampling ahead of the draglines, blending at the draglines, and careful checks of ore delivered afterward.

Details of mining operations have been given in an earlier *E&MJ* report* and methods are basically unchanged. Although four draglines operating Ocujal are electric, new orebodies being opened up will use diesel units. Expanded mining will require about 100 more men than the 240 formerly needed for production; the railroad will require 125 men instead of 100. To date, the mine has worked two shifts on a 5½-day week. Until new orebodies are contributing

to production, the mine may have to go on a seven-day week and even a three-shift basis, although working at night is difficult.

Production men at the mine are proud of the fact that the plant has never had to slow down because the mine didn't supply enough ore. It hasn't always been easy. For instance, when it rains the mine has to shut down because any and all vehicles start sliding around in the slick mud. Yet the extension of the railroad being carried out by Nickel Processing itself using equipment destined for eventual use in the mine, has probably taxed the mine department more than anything else to date.

## The New Railroad

Ocujal, the main source of ore to date, is owned by Nicaro Nickel Co., a Freeport Sulphur Co. subsidiary. A contract between this company and the U. S. Government specifies that at least one-third of the feed for the plant must come from Ocujal. The contract can be terminated by either party on 6 months notice.

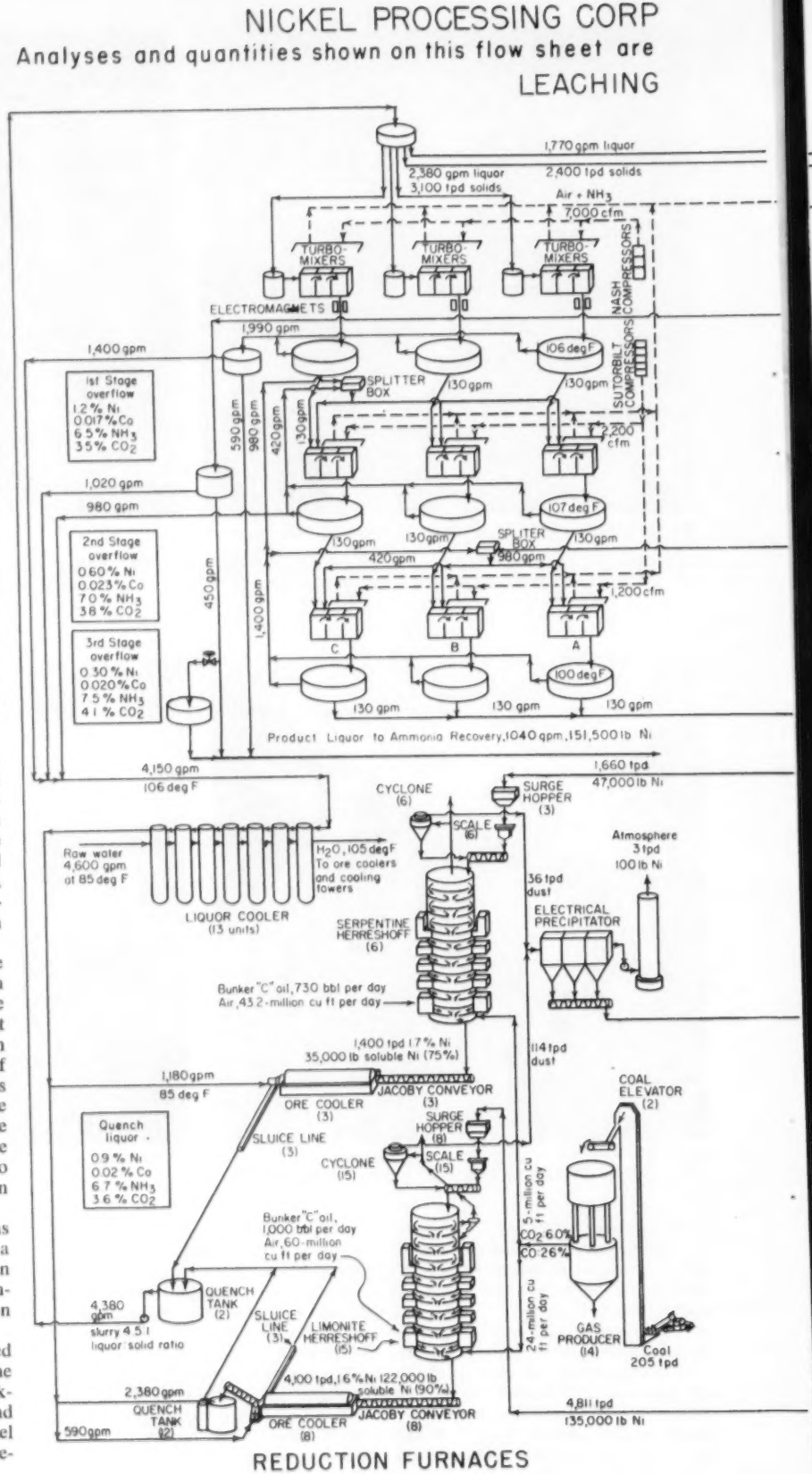
Advantages of Ocujal are its accessibility, its nickel grade and its size (about 6-million tons remain to be mined).

Chief objection to Ocujal is the royalty paid on the ore. This is based on grade and nickel price and currently runs about $1.65 per ton. The Government owns orebodies in the area which will have to be opened up sooner or later, according to GSA officials, who now forecast that opening for the last part of this year in the new orebodies.

Immediate target of the nine-mile railroad extension is the 5-million ton Ramona property just south of the Ocujal. Although further inland, it compares favorably with Ocujal in nickel grade and accessibility. East of the Ramona is the 6-million ton Las Mulas property which cannot be reached directly by railroad because it is on a relatively high plateau. Ore mined here would eventually have to be transferred to a loading point down on the railroad.

Running south and east from Las Mulas is the 8-million ton Levisa property which is slightly lower in grade than Ocujal or Ramona. Mining it will require another extension of the railroad.

These three properties are owned by Cuban Nickel Co., in which the U. S. Government is the only stockholder. (Stock is held in trust and voted by GSA officials.) Cuban Nickel also owns some scattered smaller ore-

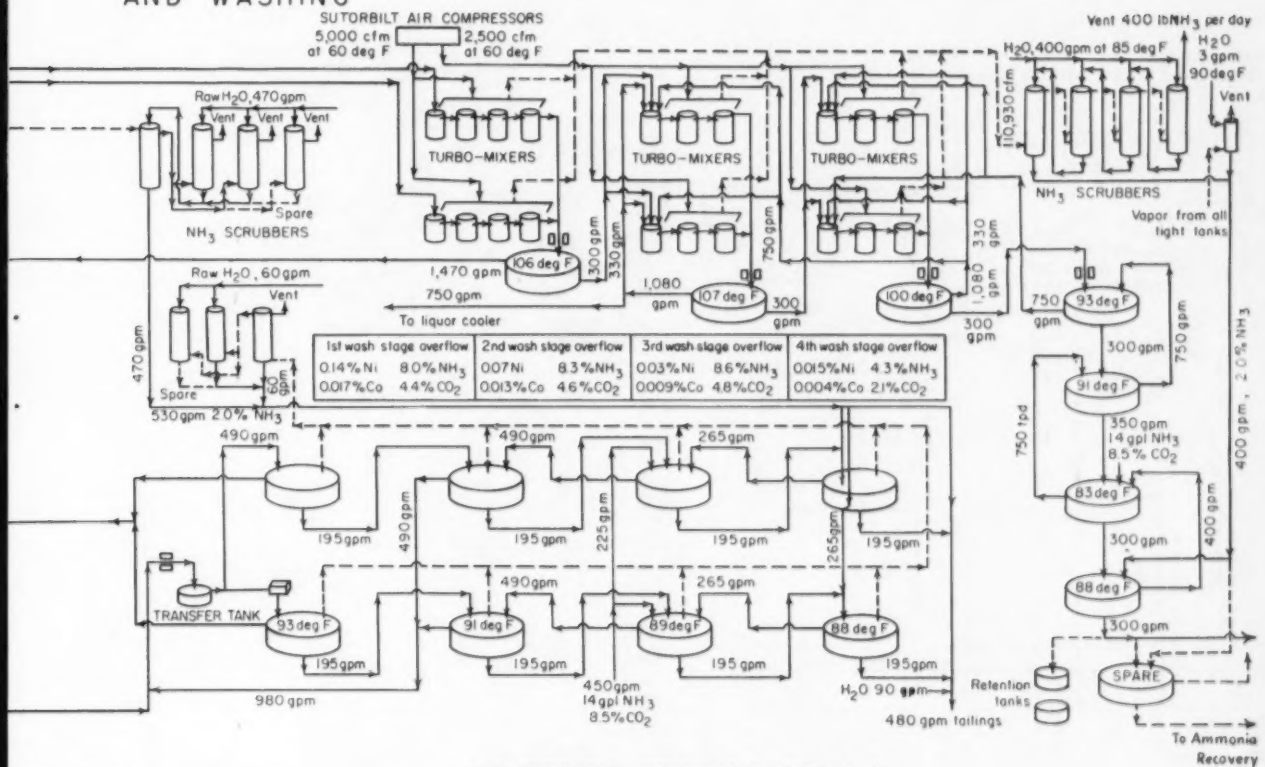



*"Nicaro Proves Lateritic Nickel Can Be Produced Commercially," *E&MJ*, June 1954.

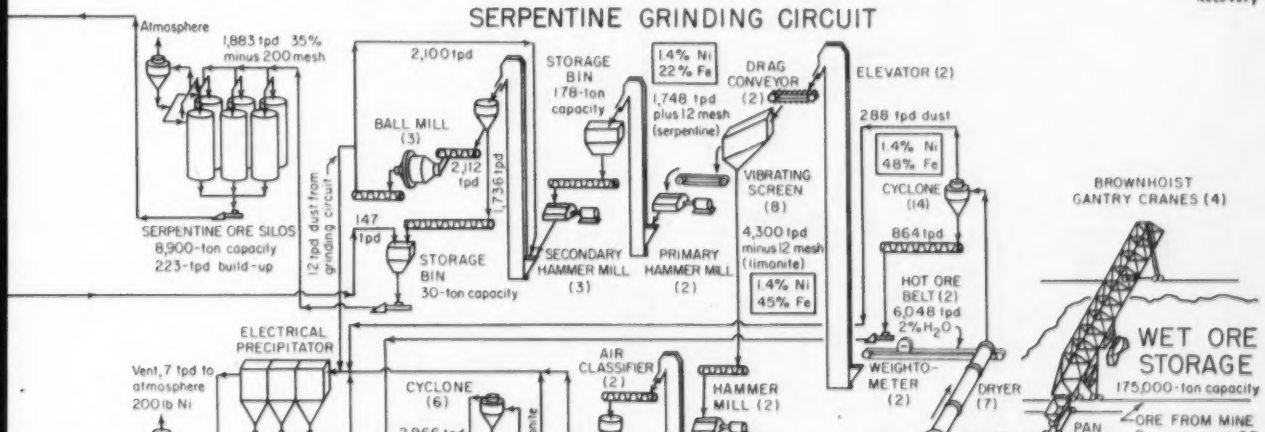
# NICARO PLANT

## approximations only and subject to variation over a wide range

## AND WASHING




## SERPENTINE GRINDING CIRCUIT

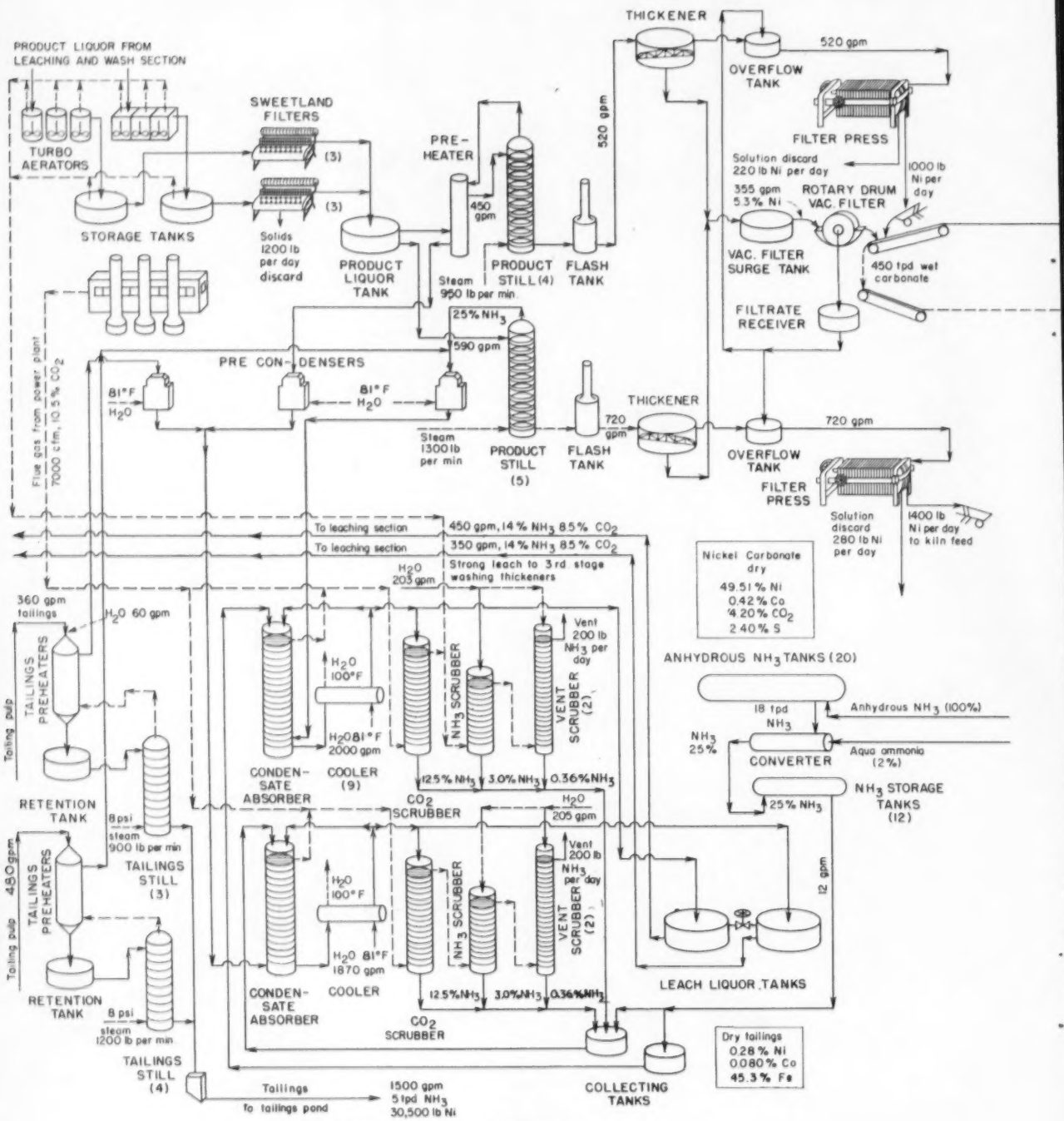



## LIMONITE GRINDING CIRCUIT

## ORE DRYING AND GRINDING

## NICKEL PROCESSING CORP.

**Analyses and quantities shown on this flow sheet are**




**AMMONIA RECOVERY**

bodies. Between these orebodies and the nickel plant lie a great many hectares, potentially ore bearing, belonging to Nicaro Nickel Co.

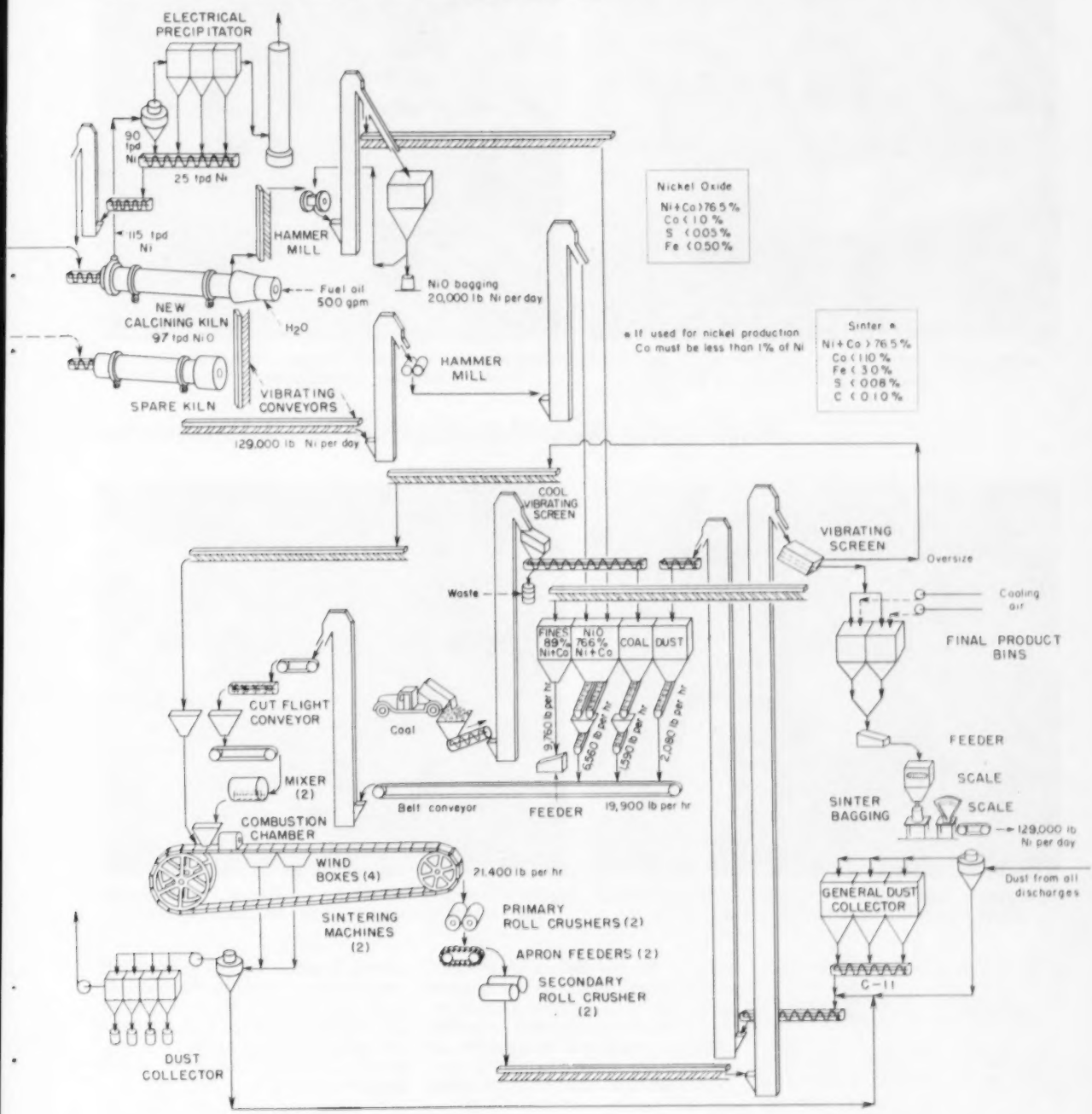
Capital cost of the railroad extension to the Ramona is $3-million and, when completed, an estimated 1,265,000 cubic meters of material will have been moved. Most of this went to fill 42 cuts, the largest of which was 438 ft long and 140 ft deep. A major engineering feat, the railroad construction and planning were carried out by Nickel Processing rather than a contractor.

### The Plant

There are five basic steps at Nicaro

## NICARO PLANT

approximations only and subject to variation over a wide range




## SINTER PLANT

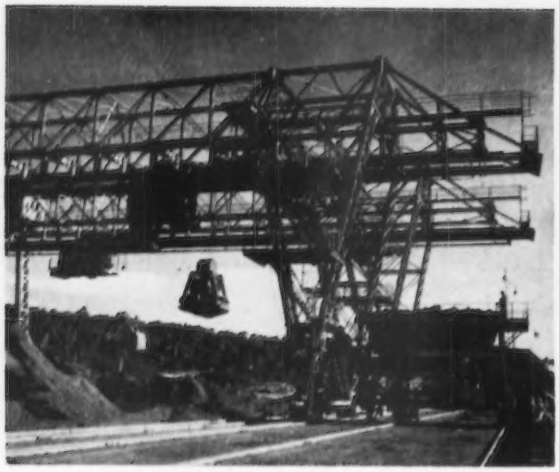
for extracting nickel from ore and producing nickel-nickel oxide sinter.

1. Reducing the raw ore in which nickel is essentially in a complex oxide form as Genthite, $2NiO \cdot 2MgO \cdot 3SiO_2 \cdot 6H_2O$, Garnierite, $(Ni,Mg)O \cdot SiO_2 \cdot H_2O$, and Nepolite, $3(Ni,Mg) \cdot 2SiO_2 \cdot 2H_2O$. This takes place in the Herreshoff furnaces which render 83% of the nickel in the ore extractable.

$$2NiO\ (\text{Raw Ore}) + H_2 + CO \xrightarrow{\Delta H\ 1350°F} 2Ni\ (\text{Reduced Ore}) + H_2O + CO_2$$

(It should be emphasized that the chemical reactions shown are simplified for illustrative purposes and do not represent a rigorous analysis of the actual reactions involved.)

2. Leaching or oxidation with aqueous

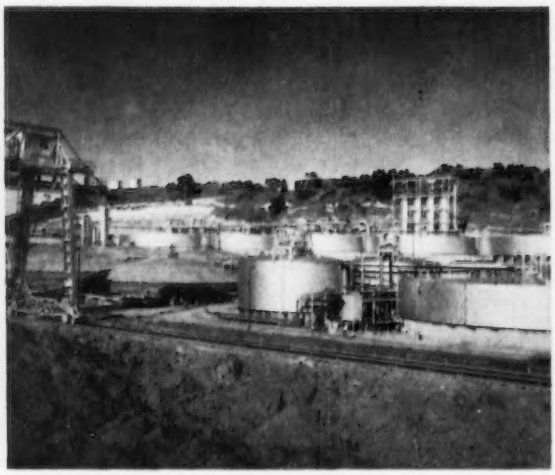


**ORE STORAGE PIT** will now have 4 Gantries instead of 2 to blend and load ore onto dryer-bound conveyor.

**TRIPPING DEVICE** makes it possible to feed driers directly rather than filling bin for relay by clamshell.

## More Units, New Material, Improved Equipment

**NEW ORE COOLERS** are 30% longer than those previously installed. Cool ore from 1,100 deg F to 180 deg F.



**STEEL TANKS** like these, for washing and leaching were not available when old concrete tanks (left) were built.

ammonium carbonate extracts about 80% of nickel.

$$Ni\ (Reduced\ Ore) + 3O_2 + 6NH_3 + CO_2 \longrightarrow Ni(NH_3)_6^{++} + CO^{=}_3 + Reduced\ Ore$$

3. Ammonia stripping of the solution with steam after the reduced ore has been washed out and pumped to tailings disposal.

$$2Ni(NH_3)_6^{++} + CO_3^{=} + 13H_2O \xrightarrow{\triangle H\ 220°F} NiCO_3 \cdot Ni(OH)_2 + CO_2 + 12(NH_3 \cdot H_2O)$$

4. Calcining.

$$NiCO_3 \cdot Ni(OH)_2 \xrightarrow{\triangle H\ 2{,}000°F} 2NiO_2 + CO_2 + H_2O$$

5. Sintering. Over-all nickel extraction is between 77% and 78%.

$$2NiO_2 + 3O_2 + C \xrightarrow{H\ 1800°F} NiO \cdot Ni + CO_2$$

Flowsheets on pp 84 to 87 give complete details of metallurgical practice at Nicaro's expanded plant including material balances, analyses, temperatures used, etc. Capacities given are averages and take down time into consideration. Specific changes in equipment between the old and new plant are illustrated above. Still, it requires a few notes to round out the picture.

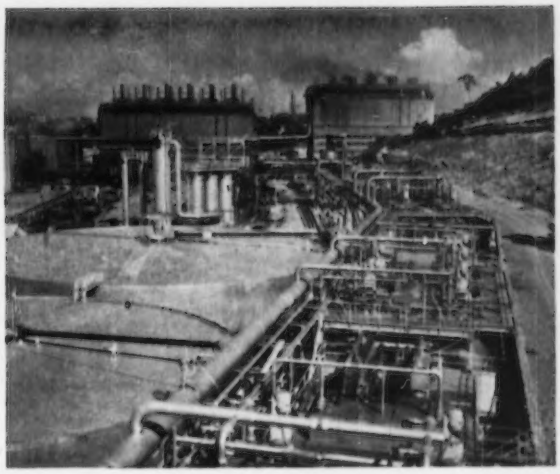
One of the significant changes in plant practice is the institution of separate limonite and serpentine grinding and furnacing sections. By running the ore over a 12-mesh screen a separation of undersize limonite ore and oversize serpentine ore in the ratio of a little better than 2:1 can be made.

Processing can be better tailored to each fraction. Under the former system of furnacing both fractions together, it was felt that the release of water vapor upon decomposition of serpentine hindered the furnacing of all the ore. Although both serp and limonite are reduced at the same temperature, separate furnacing should increase recovery.

In furnacing, the more iron the better, as nickel in limonite is easily attacked. Limonite, moreover, is easier to furnace and presents less of a scaling problem.

One of Nicaro's enduring problems may be licked by research currently under way at the plant. Government specifications say that cobalt in the final product must not exceed 1.0%. Unfortunately, some cobalt stays with the nickel throughout the process and occasionally nickel recovery must be

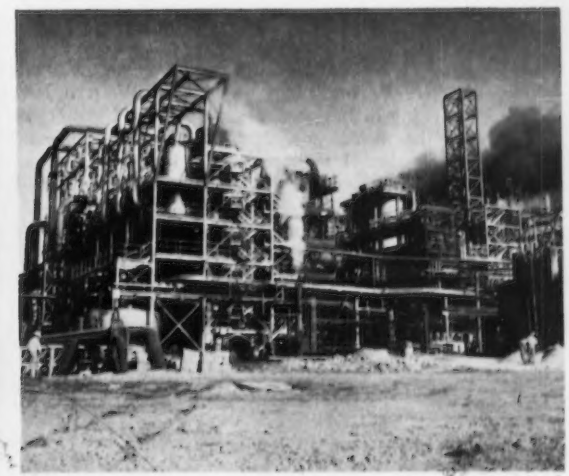
**NEW DRYING PLANT** (right) was needed for 3 new kilns. Grinding capacity was doubled by addition of 3 ball mills.



**REDUCTION FURNACES** were increased from 12 to 21 making new furnace building (right) a necessity.

## All Contribute to Nicaro's Increased Capacity

**FILTERS** yield $NiCO_3$ cake produced by stripping $NH_3$ from pregnant solution. Kiln converts cake to oxide.



**AMMONIA DISTILLATION TOWERS** for recovery of $NH_3$ from tailings before disposal, were doubled in number.

sacrificed to prevent accumulation of an excess of cobalt in the plant's output.

One answer to this problem is to extract cobalt from the pregnant liquor by precipitating it with sodium sulphide. Nickel will be brought down, too, but proportionately not as much as cobalt. After filtering, the low-cobalt liquor would be returned to the process and the Co—Ni sulphides dissolved by leaching with ammonia and separated from the sludge by filtering. A cobalt-rich sulphide would be reprecipitated in the clean liquor. After another filtering, the filtrate would be returned to the plant flow and the cobalt-rich sulphide stockpiled. Several variations on this will be tried and further testing undergone before it is incorporated in the flowsheet.

Ammonia losses amounted to over 200 tpm and are a constant target for economy-minded engineers. More than a third of the loss is in the tails and stripped product liquor also shows big losses.

Purpose of electromagnets between the turbomixers and the first stage leach tanks is to aid flocculation.

### The Future

When Nickel Processing's engineers have the expanded plant up to full capacity and know what it can do, —the Government may decide to turn the plant over to private enterprise by selling it to the highest bidder, or failing that, by leasing it. With the kind of record the plant has been building up for itself, GSA officials are confident that they can get back the $85-million investment which Nicaro represents.

Who will buy it? National Lead, whose subsidiary has been operating the plant so successfully, is certainly in the field. Freeport Sulphur Co., whose engineers built the plant in 1943 and who owns the most attractive orebodies, may well be interested despite having their hands full with another lateritic nickel project at Moa Bay. But any company with the financial and technical resources to do the job satisfactorily would be welcomed by GSA to the bidding.

Government, private enterprise, or both, Nicaro is going to be producing nickel for a long time.

**AT SANTIAGO** docks, president Sandkuhl checks concentrate.

**TYPICAL ORE** terrain surrounds mill site near Cambute.

# High Grade Manganese Source Grows In Cuba

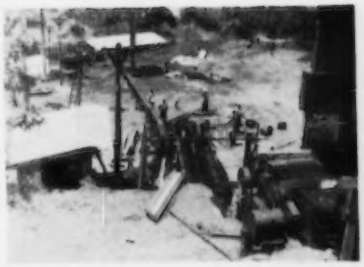
STOCKPILES of "one of the highest grade manganese ore concentrates in the world," as one ore buyer says, soon will be rising higher and moving faster from the docks in Santiago, Cuba. By November, Inter American Industries Inc. expects to reach 1,000 tpm production from its heavy media plant located 35 miles east of the capital of Oriente Province at Cambute. And a year from now the company expects to be the largest chemical grade manganese producer in the Western Hemisphere.

Inter American operates a pit and four underground mines in a 17-contiguous-claim area near Cambute. Another 17 claims are in the Los Negros area, 15 miles further west, and four are around El Iris, northeast of the capital. Their concentrating plant, claimed as Cuba's first heavy media plant for manganese, is at Cambute, but Henry Sandkuhl, president of the company, says they will construct other plants at large deposits as the company grows. Present reserves indicate over 100,000 tons of high grade concentrate and Inter American is continuing active development to prove additional tonnage.

Until a year ago the Cambute mines could be reached only by jeep or mule. Now the company has completed a road from the Cambute mines, approximately eleven miles through mountainous territory, to Dos Palmas, where it meets the main highway to Santiago. After the road was completed, during the summer of 1956, the mill, equipment and other

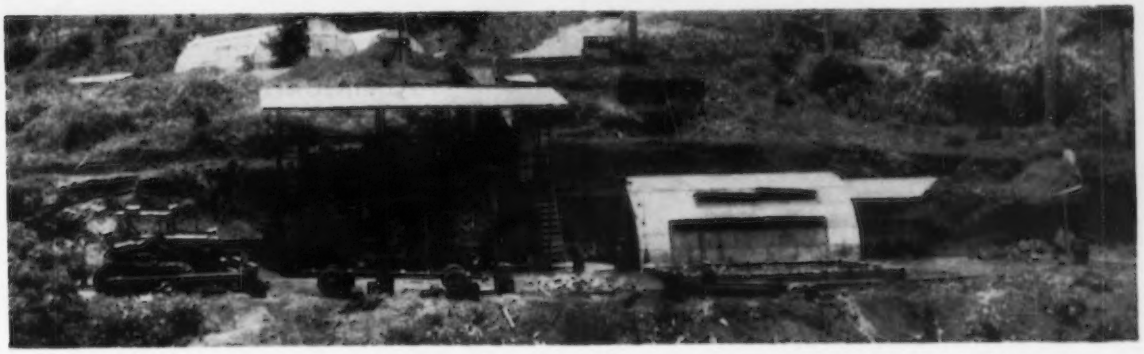
**MOBILE** air compressor is sited adjacent to adit portal at Neptuno mine (above left). At Orion mine (above), thick ore horizon outcrops. Handwinch at Guadalupe inclined shaft (far left) has now been replaced by gasoline powered unit. At Luis Segundo pit (left), no blasting is done.

**JIGS** handle fines from primary section.



**COARSE** is sluiced to heavy media plant.

**JAW** crushing starts ore to minus 1-in.



**HEAVY MEDIA PLANT** now receives crushed and washed ore from new primary section on hill above.

facilities were brought into the Cambute properties. A dam was constructed to provide water for the mill, concrete foundations were erected, and necessary buildings and housing facilities were established for the men working the mines and mill. It was also necessary to install electric power facilities. Since April, this year, the company has produced concentrates, delivered them to the dock, and has been paid.

Ore at the present time is coming from the company's Luis Segundo, Neptuno, Pasaje, Orion and Guadalupe mines. At the Luis Segundo pit, nodules of ore occur in soft material under only 12 to 18 in. of overburden. It requires no blasting. An angle dozer push-heaps ore for a Hough Payloader to load into trucks for the haul to the mill, where superintendent Rolf Hanson and his crew guide it through the processing steps.

Access to underground orebodies, from which most of production comes, is by adits and inclined shafts. Rock drilling and blasting is required. Hand tramming and gasoline winches presently bring ore to surface where Payloader loads into trucks. Rail haulage is to be installed shortly.

Ore occurs as irregular lenses, slightly dipping veins and horizontal beds in volcanic tuffs. It commonly outcrops. Values in ore break down to about 60% pyrolusite, or chemical grade ore, and 40% psilomelane, or metallurgical grade. Mine run ore, after some handsorting, is said to average 25% Mn. Concentrate shipping grades from February to late May 1957 have averaged 52.41% Mn or 82.60% $MnO_2$.

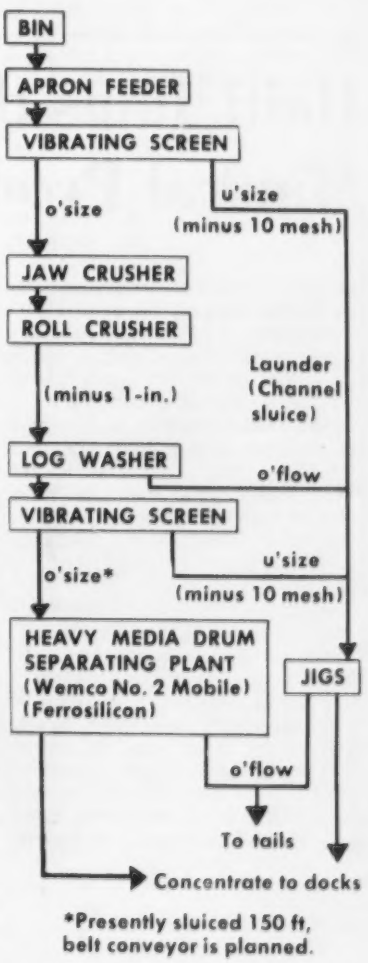
Undesirable minerals in the concentrate are remarkably low, according to Mr. Sandkuhl. Averages run less than 2% Fe, less than 9% combined silica and alumina and 0.05% P.

On arrival at Cambute mill, ore from the mines goes into a feed bin and then is crushed and washed. Fines go to jigs and coarse to a Wemco No. 2 mobile heavy media drum separating plant. (See flowsheet)

Among other personnel involved in the venture are: A. E. Van Cleve, vice president, Republic Industries, who is chairman of the board; and Dr. Thomas Wickenden, retired vice president, metallurgy and research, International Nickel Co., who heads the operating committee. Another member of the board is Martin Wolf, vice president, Continental Ore Corp. Rolf Hanson has been employed as superintendent of operations.

Mr. Sandkuhl, who has spent considerable time and effort in connection with various Cuban ore deposits, stated that the Cuban governmental authorities and local people have encouraged the venture and have been extremely cooperative. He expects no difficulties due to current political situation. Mr. Sandkuhl especially mentioned Felipe Godoy who has been a great help in facilitating ore handling and storage at Santiago.

Future plans currently under discussion include a ferromanganese plant in Cuba.




*Presently sluiced 150 ft, belt conveyor is planned.

# Haiti Joins the Mineral Producers of the Caribbean

BAUXITE AND COPPER are presently the two firmest stepping stones to Haiti's development as a mineral producer. Bauxite production, already a reality, is described on the next pages. Copper potential is still being explored.

More than 5.2-million tons of copper ore have been blocked out on a 100-square mile concession in the Terre Nueve area some 90 miles north of Port-au-Prince (see map) by Sendra, S.A., wholly-owned subsidiary of Consolidated Halliwell Ltd., a Canadian company.

Geology in the area is extremely complex. According to Dr. W. W. Webber, Halliwell's consulting geologist, as reported in *Precambrian*, rocks range in age "from middle Mesozoic to unconsolidated Pleistocene. Nearly 80% of the rock exposures are of sedimentary origin, mainly limestone with the remainder, siliceous to subsiliceous lava flows and minor intrusive stocks and bosses of quartz-diorite, granodiorite and porphyries.

"The rock formations despite their youthful age exhibit a complexity of folding, faulting, contortions and discontinuity equivalent to the knottiest problems encountered in the Canadian Precambrian."

Only a small part of the 25-year renewable concession has been explored and three deposits contain the tonnage blocked out so far. These are the Cassius, Bresillac and the Meme. The last has received the most attention.

More than 35,000 ft of diamond drilling has revealed two ore zones. An outcropping oxidized ore zone contains about 500,000 tons averaging 1.56%. A second zone consisting mainly of bornite and chalcopyrite, lying 100 to 400 ft below the surface, contains about 3.5-million tons of ore averaging about 1.9% copper. Some 2,000 ft of underground development by adit indicate that actual grade may be above that reported by drilling. Drilling on the Cassius has revealed about 700,000 tons of ore averaging 1.5% copper over a width of 15 ft.

In May, Dr. Webber told *E&MJ* editors, "It is planned that the development of the orebody (the Meme) will require a further 6 months' work, at which time we propose to commence the construction of a concentrator and other ancillary buildings. As to exploration, we have covered only a fraction of the concession area, and propose to continue on a slightly reduced scale throughout the development and construction phases."

## Other Haitian Operators

Three 24-square mile tracts, about 30 miles northwest of Halliwell, are currently being prospected under exploration permits by geochemical methods. Companies doing the work are Croiner Pershing Gold Mines, Haitian Mining Corp., and Ogama Rockland Mines.

**MINING** will eventually be handled by two 4-yd shovels like this one. The second will be on standby. Each can dig 1,500 tons per shift.

# Haitian Bauxite— From Mine to Ship

WITH THE FIRST SHIPMENT of bauxite from a new 2,000 ton-a-day mine at Miragoane, 50 miles west of Port-au-Prince, along the southern shore of the Gulf of Gonave, Haiti joins her Caribbean neighbors as an important mineral producer.

The successful opening up of the Republic's bauxite deposits, culminating three years of development, can be attributed to the exemplary teamwork of the Haitian people and Reynolds Haitian Mines, Inc., a subsidiary of Reynolds Metal Co., which will do the mining.

There are clear-cut benefits for both parties. For Haiti, there is the acquisition of a revenue producing export and perhaps even more important, there are jobs for more than 400 people in an area of the nation where jobs have been scarce.

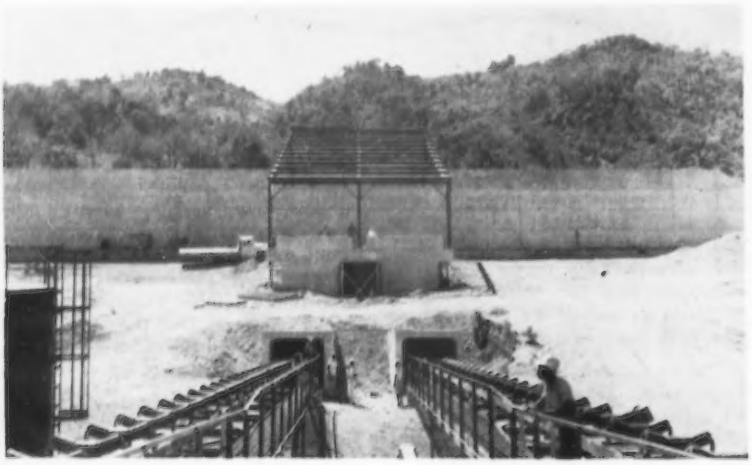
There's no question about Reynold's foresight in the development despite the higher than usual risk involved in mining in a country that can almost count its changes of government in rpm. Reynolds people realized this as part of the calculated risk, but with the bold optimism that is almost a universal trait of aluminum producers they went ahead with the $10-million development. The reason is plain. Haiti offers another extensive, nearby supply of ore for the company's alumina and reduction plants at Corpus Christi already set up to handle Jamaican bauxite.

Haitian bauxite is similar to Jamaican. It contains about 50% $Al_2O_3$

**"THERE'S THE ORE**—clear over to those hills in the distance." Mine manager E. J. Ryan points out the concession held by Reynolds Haitian Mines, Inc., northwest of the town of Miragoane (see map opposite).

**HAULAGE** from mine to dryers is handled by 25-ton trucks over a 50-ft wide road that drops 3,000 ft in 8 miles.

**ROAD SURFACING** prepared by company is Trinidad asphalt over a bituminous primer.



**TRUCKS WILL DUMP** ore over concrete retaining wall which will be 10 ft high when fill is made. Dozer will move ore to grizzly (center) for conveying to dryers.

and is high in iron (20 to 22%). It has the same reddish brown color and the same powdery and porous texture. Chemically both Caribbean ores are partially aluminum monohydrates as opposed to the rock-like aluminum trihydrate of ores from other major producing areas.

Reynolds extensive bauxite deposit is underlain by a tertiary limestone. This underlying limestone permits a rare practice in open pit mining of laterite deposits in the Caribbean; the use of a power shovel working from the pit bottom. Elsewhere in the laterites of the Caribbean area, including bauxite in Jamaica and nickel in Cuba, the mining is done by draglines working from the top because the 5 bottoms are top irregular or become too slippery with a little rain for efficient mining by shovel.

**GERALD SANSARICQ** is chief chemist with Reynolds Haitian.

**ED SHEETS,** chief engineer and Patrick Raleigh, mine superintendent.

**PAT RALEIGH** with Albert Juste, engineer at the mine.

**TWO DRYERS** provide insurance against breakdown; either oil-fired unit can handle entire daily output.

**STORAGE SHED,** 500 ft long will hold 82,100 tons of dried bauxite for shipment.

Reynolds Haitian built up a 250,000 ton stockpile during development and construction phase of the operation, using a 4-yd. Marion 111M. For routine production a second 111M has been added. It will serve initially, at least, as a standby unit in a standby mining area. Each shovel will be able to handle about 1,500 tons per shift. Where the thickness of the orebody shrinks to less than 5 ft dozers will be used to pile ore up for a later pass by the shovel.

Haitians, trained to operate the shovels, are doing an excellent job. They are helped in the fight against ore dilution by the distinctive white of the under-lying limestone which gives a good cut-off.

Fortunately they do not have to contend with the roll or pocket type deposits like those on Jamaica. At Miragoane the deposit is more like a blanket with more gradual changes in thickness. In the few spots where pinnacles of limestone (or small pockets of bauxite) make shovel or bulldozer mining impractical, other mining plans are under study.

To get the ore to the drying plant and storage area at the dock 8 miles away (by road) and 3,000 ft lower, requires a fleet of 15 Dart rear dump trucks of 25-ton capacity. The road from mine to shore was a major construction feat. It drops 1,000 ft in first 3 miles and another 2,000 ft in the next 5 mi. Nowhere does the grade exceed 10%. Width is 50 ft, enough for two wide Darts and an automobile to pass abreast. This generous width is built-in insurance for the well-trained but newly initiated first generation of Haitian truck drivers in the area.

Someday the present 8 mi of paving will be 18 mi which by current standards may make Reynolds Haitian the largest road builder in Haiti. Paving material is natural asphalt from Trinidad. A bituminous primer has been used for binding after petroleum proved unsatisfactory. The road is coated with gravel and rolled. After the excess gravel is worn off, the road has all the features of a super highway. So far it has shown need for little maintenance.

Selection of trucks for this arduous downhill haul was made by actual testing of trial units. With a haul that could burn out a brakelining on one trip, some kind of retarding mechanism was obviously required. The hydroretarder on the Dart truck, offering instantaneous response, was the more acceptable. Other models had similar features but required a certain amount of anticipation on the part of the driver, a demand which might prove excessive for the inexperienced drivers that were just being recruited and trained. Trucks dump ore from a rock fill over a concrete retaining wall to a concrete platform 10 ft below where a bulldozer scrapes it over a steel grizzly (for screening any stray limestone lumps). The hoppers below feed to either of the two conveyor belts leading to the two dryers.

Either of the two oil-fired Ruggles Coles dryers will be able to handle a full day's production of 2,000 tons. The extra unit is both insurance against dryer breakdown in this remote area where parts may not be quickly available, and is also ready when a fast expansion of capacity is wanted.

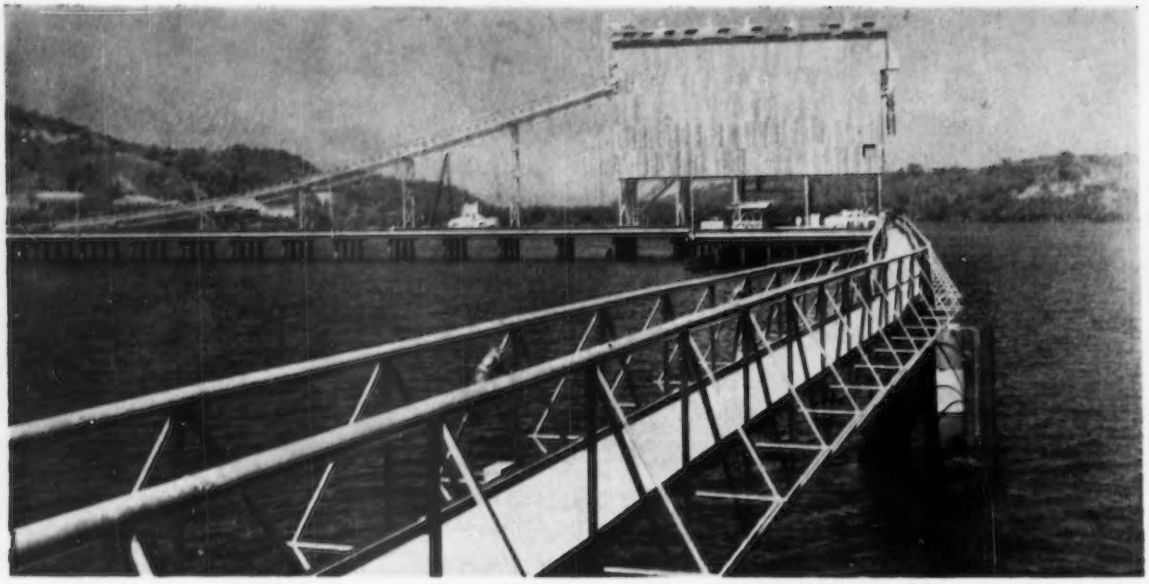
From the dryers a 700 ft conveyor belt carries the ore up and along the top of an open aluminum-covered storage shed. The shed is 500 ft long and 120 ft wide and holds 82,100 tons of dried bauxite. The floor is concrete and openings every 10 ft 8 in. permit ore to be loaded by gravity through feeders controlled from the loading dock, onto a conveyor belt running beneath the length of the shed along the centerline.

One man can control the entire loading operation spotting the hatches of the ship under the telescoping aluminum loading spout by the simple control mechanism pictured on p. 96. The loading system is capable of filling a ship at the rate of 1,400 long tons per hour.

The deep harbor and the dock (shown on p. 96 can handle the largest ore boat in the Reynolds fleet including the new 32,000-ton, self unloading S.S. Richard.

Power for the operation is supplied by 3 Cooper Bessemer Diesels, each with a 735 hp output. Each is tied in with a 625 kva Westinghouse ac generator. Two units fill normal load pulled by the dryers, shop and town-

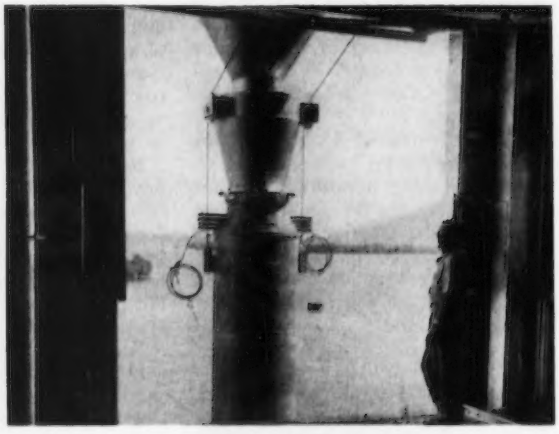
**CHIEF ACCOUNTANT,** formerly Ray Cabe (left) is now Pierre Domincq.



**DEEP HARBOR** is well protected and can handle the largest ore boat in the Reynolds fleet, including the new 32,000-ton, self-unloading S. S. Richard. Conveyor at left brings ore from the storage shed to the ship loader.

# Haitian Bauxite Can Be Loaded at Rate of 1,400 Tons per Hour

**ONE MAN** controls loading from regulating feeders at storage shed to spotting ship's hatches.



**TELESCOPING ALUMINUM SPOUT** simplifies stowing of bauxite in the ship.

site. When a ship is being loaded all three units are required. All power lines are aluminum.

Other buildings in the plant area include a garage for servicing the Dart fleet, complete shop, office and warehouse; all feature aluminum siding, of course.

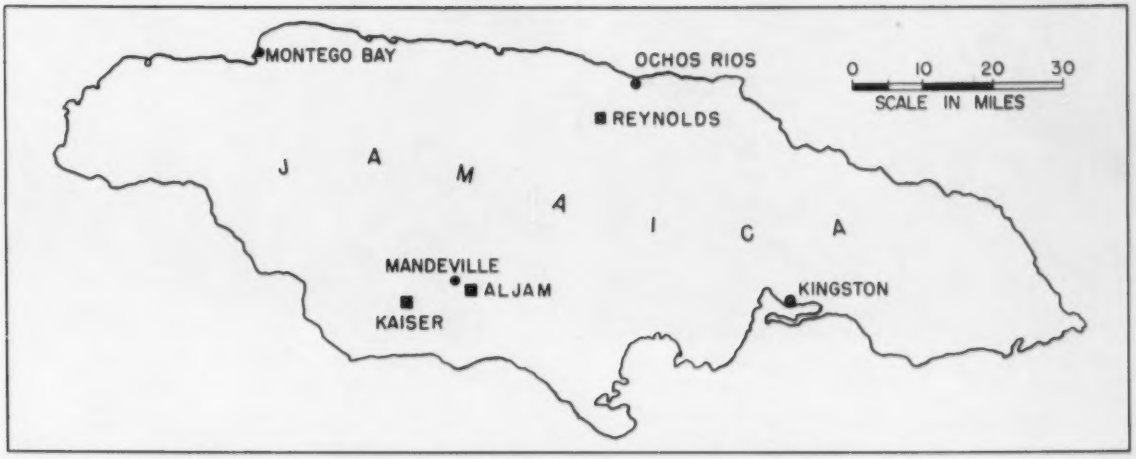
This development of the mine at Miragoane opens up a new source of bauxite. Certainly this is important—to the Reynolds company whose business is aluminum and to the people of the United States who consume more aluminum than anyone in the world. But perhaps its greatest significance is its impact in Haiti, for in an area of abject proverty it is literally true that the naked have been clothed, the starving have been fed and the sick have been healed because a mine has been developed.

For instance, Reynolds built a hospital incorporating the latest modern equipment and hired a doctor for the care of its employees and their families. Now, because four out of every five patients are not connected with the company, they are expanding the hospital to 20 beds, hiring another doctor and increasing the nursing staff. Why? The company says simply, "It's the only hospital in the area and you can't turn people away."

For instance, when a nearby town was hit by the full force of a hurricane last year, food, medicine and equipment from Reynolds Haitian were the first on the scene.

For instance, Reynolds Haitian is paving the roads in the town of Miragoane, converting them from endless mud sloughs into clean streets. They are cleaning off a wide area near town and filling it so that the townspeople can have a sanitary market place.

Reynolds' development in Haiti may have to navigate some stormy political seas in the coming months, but with the determination, enterprise and good will so far demonstrated, the odds are long on a successful future for the bauxite industry in the Republic.




**BAUXITE** is mined in three parishes of Jamaica with reserves estimated at over 500-million tons. Recently, both Alumina Jamaica (Aljam) and Kaiser have announced new mining developments on the north coast of the island.

# Mining in Jamaica Means More and More Bauxite

BY 1959 ANNUAL PRODUCTION of bauxite in Jamaica will top 6-million tons. Add to this the 720,000 tons of alumina produced on the island and you have a picture of vigorous growing industry.

While bauxite steals the spotlight, there is exploration going on for iron ore and copper at the eastern end of the island for the first time in a century. Company doing this exploration is Jamaica Copper and Iron, Ltd., of Kingston. Little is known of their progress except that they have reached the point where they are actively looking for iron ore customers.

Big three in bauxite are Reynolds Jamaica Mines, Ltd., Alumina Jamaica, Ltd., a subsidiary of Aluminium, Ltd., and Kaiser Bauxite Co. Figures released by the companies show that in four years their investment has trebled. According to *Spotlight,* monthly Caribbean news magazine, by next January, "1953's $100-million will represent the investment of one company alone (Alumina Jamaica)."

One characteristic of bauxite mining in Jamaica that strikes the visitor is the obvious determination of all three mining companies to make the island a better place for their having been there. Beyond adding to the local government's revenue (to date they have paid an estimated $13-million in taxes) and maintaining payrolls numbered in the thousands, they have boosted local agriculture by improving cattle breeding, expanding and improving the citrus fruit industry, engaged in reforestation and made more land available for local farmers. In addition, serious efforts have been made to establish a local textile industry. Part of the companies' arrangement with the Jamaican government included restoration of the land after mining is over.

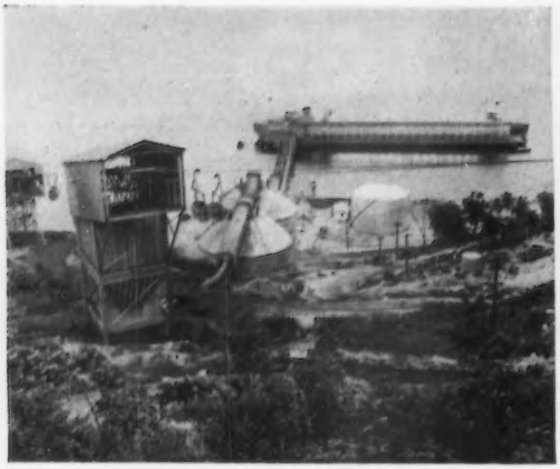
Jamaicans in return, have shown an aptitude toward the intricacies of handling modern industrial equipment and have proved willing and cooperative workers.

Dried bauxite is shipped by Reynolds to its La Quinta alumina plant in Corpus Christi, Tex., which was especially designed for Jamaica ore. Kaiser ships dried bauxite to its alumina plant at Baton Rouge. Alumina Jamaica ships alumina to Kitimat at British Columbia and to Europe.

Jamaican bauxite was first recognized back in 1869 by two geologists named Brown and Sawkins. It was interesting, but beyond that merely a source of frustration for the farmers. It was nearly a hundred years before anyone moved in to tap the more than 500-million tons of "red dirt" that is estimated to lie in the three parishes which are the scene of current mining operations.

In 1942 Sir Alfred d'Costa sent a sample to the Imperial Institute in London for a check. Exploration began in 1942 along with research into the processing of this bauxite that was different from most such material that had previously gone into production of aluminum. First shipments were made in 1952 and by 1956 more than 3-million tons were being mined and shipped as bauxite or alumina.

Today the bauxite industry might well be termed the backbone of Jamaican economy along with the tourist trade and the real estate boom it is currently inspiring. In fact, riding through the countryside, which looks so English despite the exotic setting, one wonders what Jamaica did before.



**PORT** at Ochos Rios on north coast has recently been improved. Aerial tramway brings ore in from mine.

**BAUXITE** goes from this storage pile into dryers. Two new kilns just installed double drying capacity.

# Reynolds Jamaica—Still Growing

PRODUCTION CAPACITY of Reynolds Jamaica Mines, Ltd. has been virtually doubled with a total expenditure of about $7-million for new equipment and facilities. The mines are now producing at the rate of about 2-million tons of bauxite a year. New equipment includes:

**Mining.** Additional shovels and trucks and two new Traylor rotary kilns for drying bauxite, 9 ft in diameter by 175 ft in length, making total of four kilns;

**Aerial tramway.** A second aerial tramway for carrying bauxite six miles from the mine to the storage and loading dock at Ocho Rios. The new tramway, built by Riblet Tramway Co., parallels the original tramway built by Ropeways, Ltd. and each has a capacity of 1-million tons a year, operating around the clock. Tramway consists of buckets on a continuous cable, each bucket holding one ton of bauxite;

**Dock storage and loading facilities.** Previously had two 12,500-ton storage silos. Have added storage building that will hold 120,000 tons. It is 640 ft long, 131 ft wide and 93 ft high, believed to be largest bauxite storage building in world;

A second tower loaded with conveyor equipment has been added to bring loading capacity to 3,600 tons an hour. There are now two Hewitt-Robins conveyors, each feeding a tower loader from opposite ends of the new storage building. In loading a ship the two towers work simultaneously, moving on rails along the dock and dumping bauxite into ship through long snouts. Drag Scraper Co. built both towers;

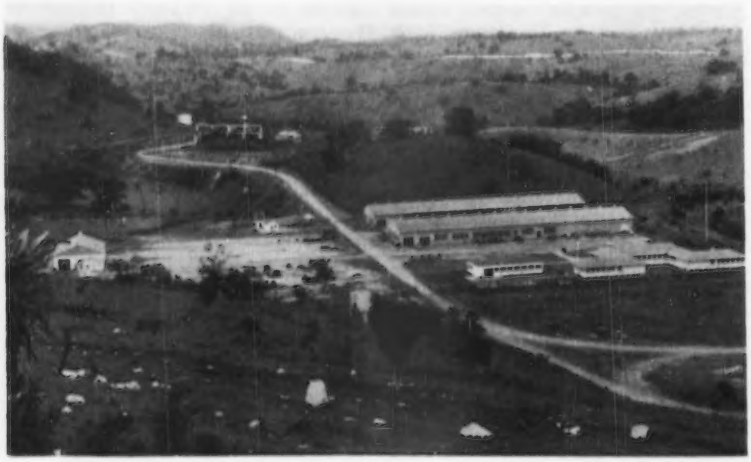
**Pier** has been lengthened from 465 ft to 705 ft. Raymond Concrete Pile Co. was the contractor.

Oil storage capacity at the dock has been doubled to make it 60,000 bbl. The oil is pumped uphill through a six-mile pipe to the mine where it fuels the drying kilns.

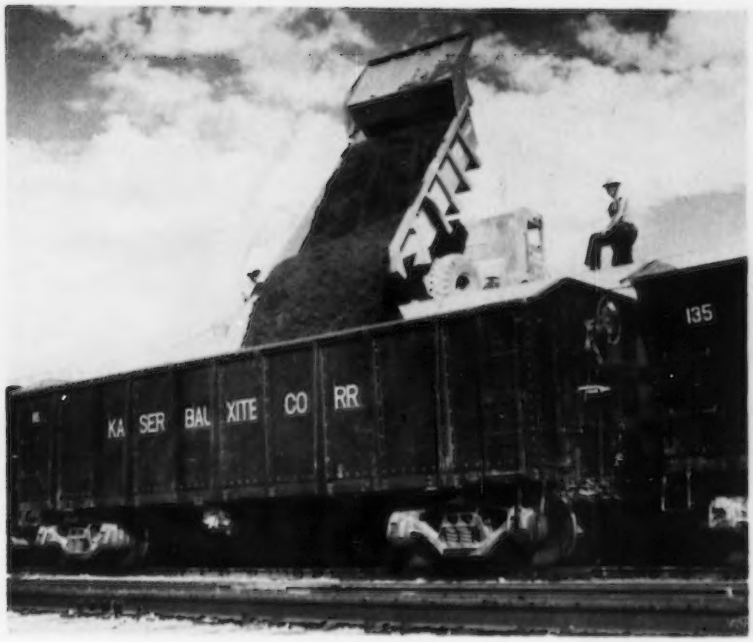
**Ships.** Caribbean Steamship Co., an affiliate of Reynolds Metals Co., has the following ships in operation: S.S. Richard, with 32,000 tons capacity, largest self-unloading ore carrier in the aluminum industry; S.S. Dragon, a conventional ship of 7,200 tons capacity; and S.S. Carl Schmedeman, a 13,000 ton self-unloader. Soon to be delivered is a new ship, the S.S. Louise, a 16,500 ton self-unloader constructed in Sweden. In addition, the company has other ore carriers under charter.

Mines and loading facilities are now operating at about 200,000 tpm average capacity. Since 1944, Reynolds Jamaica Mines, Ltd., has acquired approximately 60,000 acres of bauxite properties in Jamaica.

The story of Reynolds ore after its departure from Jamaica was published in the December 1952 issue of *Engineering & Mining Journal*, by James A. Lee, Houston correspondent.



**HEADQUARTERS** for Reynolds' operations is in Lydford. The company has invested over $35-million in Jamaica. Recent expansion will up productive capacity.




**THE BAUXITE** is hauled from the mines by heavy duty trucks and dumped into Kaiser Aluminum hopper cars at New Buildings to continue its trip to the Jamaican coast.

# Kaiser Operations in Jamaica

KAISER CORP'S Jamaican bauxite developments will expand operations to 4,100,000 tons annually. Extensive mining areas on the island's north shore will be added to company's present pit working in St. Elizabeth Parish for total output.

Kaiser's present operations were begun in 1947 when Little Pedro, a St. Elizabeth fishing village, became site for Port Kaiser. Designed to be the land-ship ore transfer center, Port Kaiser was linked to mine by a rail line cutting through the Santa Cruz Mountains. Corporation had purchased 850 acres of former cattle grazing land for its first mine site, New Buildings, and administration offices were built at Spur Tree, directly overlooking the mine from a 2,000-ft elevation. Workshops were erected at the mine for small repairs and at Port Kaiser for major maintenance of mine and plant machinery. Spur Tree and Duff House (6 miles from port) became plant personnel headquarters.

Extensive surveying and sampling showed that surface bauxite deposits were usually found in grassy depressions near limestone outcrops. Data obtained by hand prospecting auger drillings furnished bottom-of-ore contours and cross section charts which helped determine the size and shape of the deposits. If bauxite body seemed large enough and within reasonable hauling distance, Kaiser began to mine.

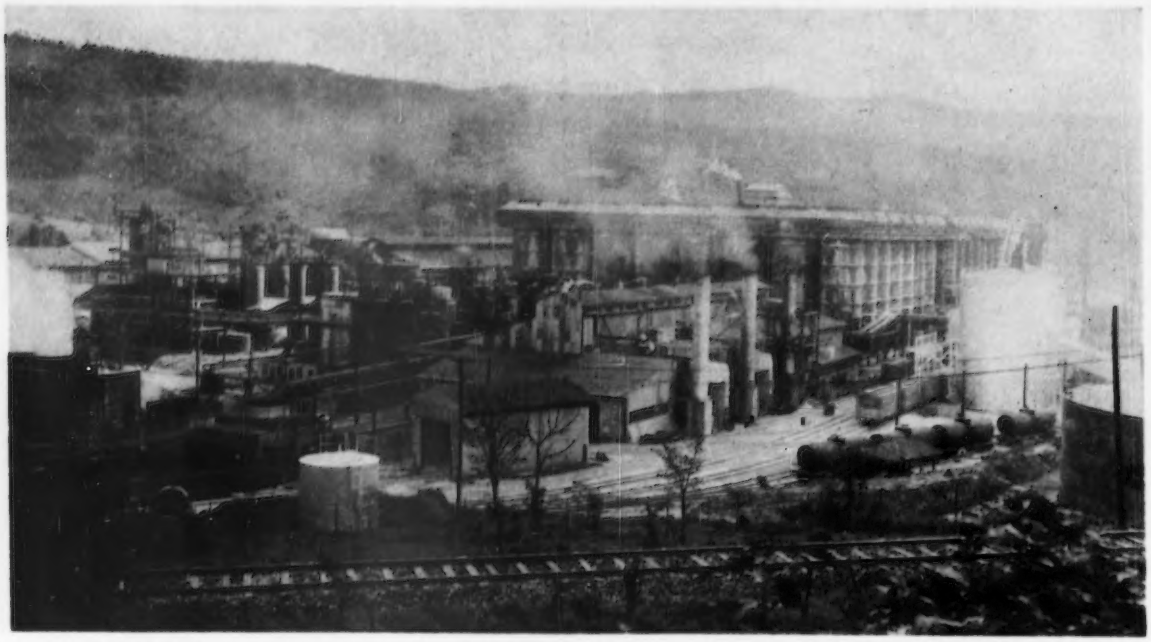
Kaiser planners went to great lengths to make sure that the region would be restored to its former condition after mining had ceased. First step was to bulldoze off 1 ft of topsoil and stockpile it at edge of proposed pit. Then Marion (111M & 93M) power shovels made cuts across the entire area. They followed a tractor with rooter attachment which sped production by feeding the units. Draglines were used when pit got too deep for efficient shovel operations. Boundary between bauxite and underlying limestone was very irregular and the larger blocks of polluting material were removed before rail shipment to Port Kaiser. By working several pits simultaneously they made sure that aluminum content met Baton Rouge specifications. At Port Kaiser, high silica bauxite was mixed with low silica ore before loading.

Bauxite was transported to the train loading ramp at New Buildings in Model 80 15-ton Euclid dump trucks equipped with 25 in. sideboards which raised load capacity to 14 tons per truck. Four miles of main haul road (minimum width 25 ft) linked the deposits with loading ramps. Bunker "C" oil gave hardness to road's limestone surface. Ruling grade on main roads was 3.5% against the load and feeder road grade was 5%.

Railroad loading ramp at New Buildings, from which ore trucks could dump directly into rail cars for shipment to the port, had pre-cast, concrete slabs. Ruling grades on 12.5-mile rail track were 2.2% with the load and 1.5% against the load. From pier area, the grade rose at 2.2% for 6.5 miles and then leveled off for three miles, while remaining 3 miles to New Buildings had a descending grade of 1.5%. During construction of the railroad, engineers encountered a fault zone at cliff section near Port Kaiser. 45,000 cu yd of limestone had to be loosened and for this purpose Coyote blast was used.

Stockpiling topsoil at pit perimeter was merely the first stage of Kaiser's elaborate land restoration plan. After re-leveling pit and covering the area with 6 in. of soil, company researchers planted crops most suitable for the climate, terrain, and probable needs of the future settlers. Soil-binding Pangola grass supported mahogany, mahoe and cedar trees.

Land reclamation, though of greatest importance, was by no means Kaiser's sole good-will project. Schools, housing and recreational activities for both American and native population greatly reduced possible tensions which were until recently considered unavoidable when major industrial projects were undertaken in foreign countries. Emphasis on public relations, as shown by Kaiser's Jamaican activities, can be of great value to both miner and landowner.



**KIRKVINE WORKS,** owned by Alumina Jamaica, Ltd., is the only alumina plant on the island. It has grown steadily from an initial capacity of 100 tpd in 1953 to 1,350 tpd today. Aljam is now building another plant at Ewarton.

# Alumina Jamaica—The Plant That Wouldn't Stop Growing

JUST COMPLETED at the Kirkvine Works near Mandeville, Jamaica, is the most recent step of an expansion program that has steadily increased the daily capacity of the plant to 1,500 tons of alumina from the 100-tpd capacity it boasted when the first shipment of alumina was made in January 1953. Total investment has reached $60-million.

Although Alumina Jamaica, Ltd., wholly-owned subsidiary of Aluminium Ltd. (Montreal), plans further increases in production of alumina from Jamaica, its Kirkvine Works will get some respite from almost constant expansion, since a 670-tpd increase will be obtained from a new plant under construction near Ewarton.

## Another Type Bauxite

Jamaican bauxite is higher in iron and lower in alumina content than most bauxites of the world, and to extract alumina from it requires modification of the orthodox Bayer process. Because of the bauxite-alumina market economics peculiar to the industry, two of the three companies mining bauxite on Jamaica ship the ore to plants in the U. S. which have been converted to handle Jamaica bauxite. Only Alumina Jamaica (Aljam) has built a plant in Jamaica to extract alumina.

Extraction of alumina from bauxite is basically a simple process. The alumina is dissolved by hot caustic soda and the residue consisting of iron oxide, silica and other impurities, is removed by settling and filtering. Dissolved alumina is precipitated from solution as alumina hydrate and the final product, a fine, white, salt-like powder is produced by driving off the water from the hydrate in rotary kilns. Application of this process is a little more complicated. Here's how it works out at the Kirkvine Works.

Carryall scrapers, coming from the mine, dump ore in a storage pit where overhead cranes using clamshell buckets can pick it up for charging to any of 5 Hardinge 6x8 ball mills. Actually, the function of the ball mills, which operate in closed circuit with DorrClones is as much slurrying as it is grinding. Spent solution from the process is added and operators try to produce a slurry that runs a consistent percentage solids that experience has shown offers the best extraction of alumina from impurities such as FeO, silica, etc.

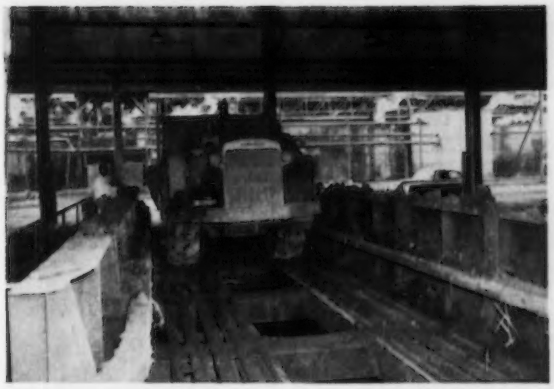
Grinding in the ball mills reduces the limestone and silica present to 35 mesh to keep these materials from fouling up the settlers further along in the process. The grinding section is shut down once a day for 30 min. for cleaning and maintenance. One ball mill and two DorrClones are always on standby.

Slurry from the 5 ball mills is pumped to 6 tanks equipped with Hardinge agitators for storage and blending.

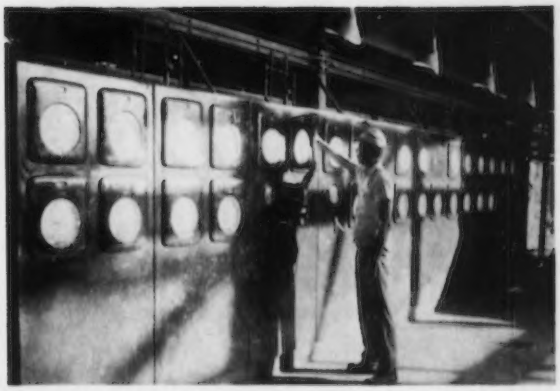
## Digesting

Dissolving of the alumina takes place in two parallel sets of digesters. Dissolving agent is a 12% caustic solution which has replaced the earlier practice of using lime and soda ash. (The cost is lower since liquid caustic is shipped from England in vessels that carry molasses from Jamaica on the return trip.)

Spent liquor from later in the process, after regenerative heating, joins the bauxite in the digesters and is further heated in the first digester of each series by power plant steam. Temperature in the digester is about



**INCOMING ORE** is dropped by scraper from movable bridge into pit. Clamshells will feed it to the ball mills.

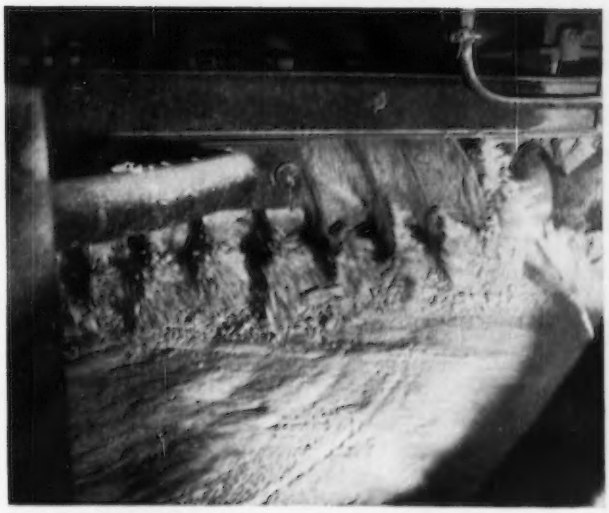


**DIGESTERS,** controlled at this point, dissolve $Al_2O_3$ in ground bauxite. Caustic soda is the solvent.

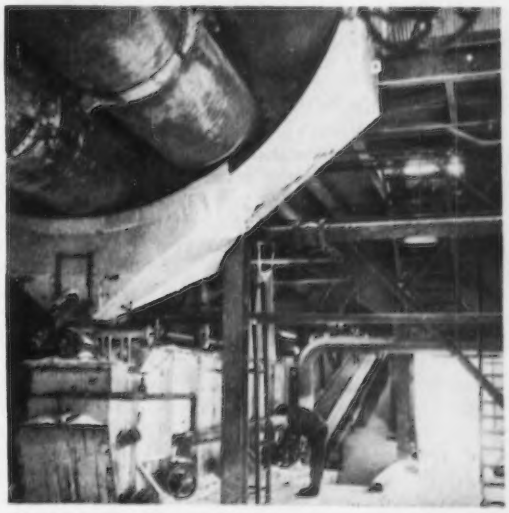
## Six Steps in Producing Alumina from Bauxite in Jamaica

1. **Grinding and slurrying the ore.**
2. **Dissolving of alumina in digesters.**
3. **Filtering to separate alumina from iron oxide, silica, etc.**
4. **Precipitation of alumina hydrate.**
5. **Settling and filtering of alumina hydrate crystals.**
6. **Driving off moisture and chemically combined water, in kilns, to produce alumina.**

**PRECIPITATION TANKS** hold ¼-million gal. Alumina hydrate seed encourages precipitation from solution.



**VACUUM FILTER** removes most of moisture from newly precipitated and sized alumina hydrate.



**KILN COOLERS** deliver 600-deg F alumina after 1,800-deg F heat in kiln has driven off combined water.

## Mining Can Be Tricky

**DRAGLINES,** loading into carryall scrapers and aided by bulldozers and rippers, mine most of the ore.

**SCRAPERS,** often push-loaded by a bulldozer, mine shallow ore but can't handle the deep rolled deposits.

290 deg F and the pressure is about 50 psi to keep the mixture from flashing. Retention time in either digester system is about 45 min. Discharge from digesters goes to three flash tanks feeding several regenerative heaters.

Of the two digester systems or units, one is comprised of 6 digesters, and the parallel unit has 8 digesters of various sizes.

This variation in size of digesters is due to the phenomenal growth of the plant. Not only did the engineers gain in experience, but frequently it was a matter of fitting new units into a plant that grew from a daily capacity of 100 tons to 1,500 tons.

Each digester system now handles enough volume to produce 750 tpd of alumina. The ore has about 42% alumina available and the process extracts about 98% of this. Besides dissolving the alumina, the digesters desilicate and dephosphorize the liquor.

Actually most of the work is done in the first digester of each series. These have to be descaled every two months while the last digester only has to be descaled once a year. Total scaling in pipes and digesters amounts to about 20 tons of material a year.

### Thickening

Flow from the digesters goes to 5 primary Dorr thickeners. Overflow from these thickeners goes to the filters; the underflow or "red mud" goes through stages of counter current washing similar to any counter current decantation operation. Boiler condensate and mill water make up the wash liquid. Washed mud finally goes to ponds in mined-out areas of the mine.

Filtration takes place at 210 deg F. The filtrate is then passed through the vacuum flash tanks which reduce the temperature to about 160 deg F. Vapor given off in the flash tank is used to heat spent liquor. Full production requires pressure-type filters with enough individual leaves to give sufficient filter area. Filter cloth is 14-oz canvas manufactured locally. Filters are washed down every 6 hr, and the cake goes to the ponds.

Clear filtrate or pregnant liquor goes to the battery of precipitation tanks, each 80 ft high, holding a quarter of a million gallons. When a precipitation tank is filled with pregnant liquor, compressed air is injected for agitation and seed crystals of alumina hydrate are added to encourage precipitation. At present the company has approximately 16,000 tons tied up in the precipitation system.

### Settling

Solution from the precipitation tanks containing alumina hydrate crystals is pumped to the settlers. Three primary settlers have an upward stream velocity such that the coarsest fraction settles and the rest is swept out. The coarse fraction runs about 28% plus 200 mesh.

In six secondary settlers, which, incidentally, provide some storage capacity, stream velocity is cut one-third and the middle size fraction settles out. This is used as coarse seed for the precipitation tanks.

Overflow from the secondary settlers is clarified in 6 tray thickeners and the fine seed recovered. Ratio of coarse to fine hydrate is about 3:1.

The clarified overflow from the trays is spent liquor containing about 45 grams per liter $Al_2 O_3$ as compared to 90 gpl in the pregnant liquor going to the precipitation tanks. About ¾ of the spent liquor goes to the evaporators for reconcentration, and from there it goes to the digesters with some via the ball mills.

Alumina hydrate, about 30% solids, is pumped as a slurry to four vacuum filters each located at the feed end of four kilns. After filtering, the remaining moisture, about 12 to 15%, and the chemically combined water are driven off in the kilns.

The kilns are counter-current and operate at 1800 deg F. The oldest of the kilns is 220 ft long with diameters of 9, 10 and 11 ft. The other three are 270 ft long, about 11½ ft in diameter. Alumina leaves the kilns after passing through Unax-type coolers that are an integral part of the kiln. Heat of the alumina is given up to heat the air that supports combustion in the kiln and thereby an important recovery of heat is obtained. Additional coolers bring the temperature down to about 150 deg F. Belt conveyors take it to six 2,000-ton storage silos with Hummer screens to take out the oversize mainly spallings from the kiln lining. Fuller-Kinyon air slides at the bin bottoms are used for loading cars.

Built in the expansion program are two 250-ton catenary bins for loading directly into cars.

From the storage bins at Kirkvine Works, the greater part of the alumina is loaded in bulk into specially-designed hopper cars, which have been built almost entirely of aluminum in order to reduce dead weight. There are 30 of these cars, each carrying

## Loading Is Simple

**RAILROAD CARS** are loaded at Kirkvine with simple canvas spout.

**SHIPS** are filled by this well engineered loader at Port Esquivel.

about 50 tons, with 6 steel cars of less capacity. For customers who are not equipped to handle alumina in bulk, the alumina is packed in hundredweight bags of six-ply paper and transported by boxcar.

At the end of its 32-mile journey by rail to Port Esquivel, bulk alumina is discharged from the hopper cars into a bin below the rail tracks and taken by conveyor belt to the dock storage silos. The bagged alumina is taken by fork-lift trucks to the pier storage shed.

### Port Facilities

Built on the site of Puerto d'Esquivel, established by the first Spanish Governor of Jamaica, Don Juan d'Esquivel, in 1509, the new Port Esquivel lies behind the chain of coral reefs a mile offshore which protects the port. Over 3-million cu yd of mud and coral were dredged out to provide a deepwater channel and a turning basin. A pier, 600 ft long, built of concrete and steel piles, provides berths for two vessels at the same time. Water depth of 32 ft enables all but the very largest vessels to use the port.

On the pier itself is a storage shed with a capacity of 3,500 tons of bagged or other cargo. On shore, from the four alumina storage silos, each with a capacity of over 10,000 tons, the bulk alumina is taken by conveyor belt to a loading tower on the west side of the pier, and is discharged into the ships' holds at a rate of 700 tph.

Specially-adapted vessels are used in the bulk alumina trade, and recently the S. S. Sunrip, the first vessel designed especially for the alumina trade, has been placed on the run between Port Esquivel and overseas smelters, by Saguenay Terminals Ltd.

In addition to facilities for handling alumina and incoming cargoes and for bunkering vessels, the port provides fuel oil storage and a well-equipped machine shop for ship and other repairs.

### Power

In alumina production, the power plant is especially vital. Capacity of the Kirkvine Works power plant is 20,000kw supplied by 4 oil-fired boilers: one is a 55,000 lb per hr (Foster Wheeler), the other three are 220,000 lb per hr (Combustion Engineering).

There are four turbines. A 2,000kw single extraction unit with condenser, extracts at 100 psi for the digesters. A 6,000kw double extraction turbine with condenser extracts at 100 psi for the digesters and at 35 psi for the evaporators.

There are also two 7,500kw back pressure turbines extracting at 100 and 35 psi. The evaporators act as condensers for these units.

Four evaporator units are in service:

No. 1 Quintuple effect 35,000 lb per hr.

No. 2 Sextuple effect 130,000 lb per hour.

No. 3 and 4 Sextuple effect 170,000 lb per hour.

Evaporators save water and cut steam costs and these factors must be weighed against soda loss in the red mud. The more water used, the lower the chemical loss. At Kirkvine, which makes its own power, there is also the plant power balance to consider.

Make up water for the process comes from four wells, about 4 to 6 miles from the plant which pump to two reservoirs of one-million gal capacity each.

### Mining

Feed for the Kirkvine Works lies practically at the door step. The bauxite deposit fills irregularities in the underlying limestone and thus has no uniformity and little continuity, but occurs more in pockets, some as deep as 120 ft. In the middle of some of these pockets, pinnacles of limestone may be found as wide as 15 ft and as high as 40 ft. There is no real overburden, but the law requires that 9 in. be stripped off the top to be stockpiled until the land is rehabilitated and then spread back across the surface. Aljam takes more than 9 in. to be on the safe side.

The soft, granular red ore requires no blasting. Production of 4,500 tpd is maintained by two 4-yd draglines, with a 2½-yd unit as a standby. As in most laterite mining, the draglines work from the top of the ore pockets, loading into rubber-tired carryall scrapers (Caterpillar DW21). Bulldozers are often used in the irregular pockets to pile inaccessible ore for the draglines. In this area of high rainfall, draglines are used for everything because shovels gum up.

Scrapers are used for haulage because the ore sticks badly in truck bodies while the scrapers have positive ejection. When a dragline is out of action, scrapers can be used for mining, and one or two gently sloping, shallow areas are always available for that purpose. In some cases the scrapers are push-loaded by a bulldozer. Eleven scrapers and five bulldozers serve the mine.

Ore is blocked out for mining by drilling 80- to 120-ft holes on 100-ft centers.

Equipment operators are local people, trained by the company. After a little experience on the machines, they do an excellent job. The mine works one 8½-hr shift, seven days a week.

### Agriculture

With some 30,000 acres of property to administer, only ⅛ of which will be mined for bauxite, Aljam has worked hard to increase agricultural production. Over 15,000 acres are rocky hillsides unsuitable for agriculture, and these are being conserved for their timber, and where necessary, reforested. To date about 400,000 hardwood trees have been planted. Remaining areas are mainly pastureland, best adapted to the raising of beef cattle. Starting with small mixed herds acquired with the properties, the

**DR. D. A. BRYN-DAVIES,** chairman and managing director.

**S. M. PATTERSON** is the Kirkvine works manager.

**G. C. VAIR** holds the office of secretary.

## Meet a Few of the Men on the Alumina Jamaica Team

**ERIK TANDBERG** is calcination supervisor.

**R. D. McQUIRE** is production manager at the Works.



**R. E. CRUM-EWING** is manager of agriculture division and director.

**W. RYLE-DAVIES** heads up the public relations department.

**E. F. FROST,** is Aljam's chief mining engineer.

**NORMAN PHILLIPS** is chief engineer at Port Esquivel.

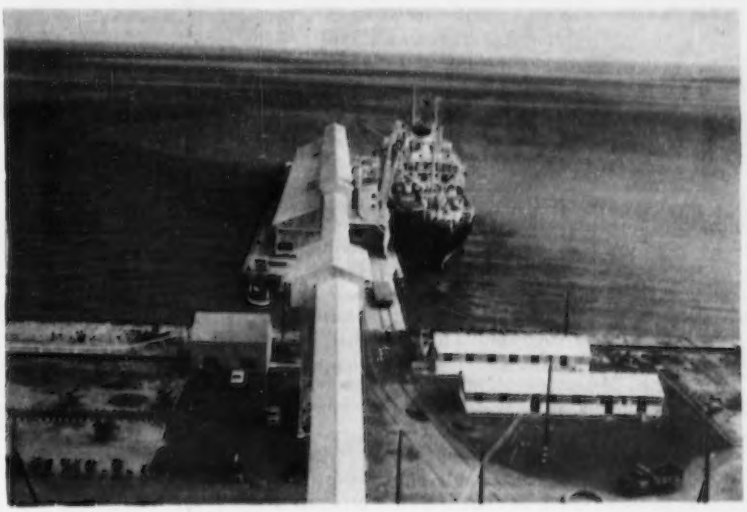
company now has 4,400 head of beef cattle, mainly of the Jamaica Black and Jamaica Red types. Breeding herds of purebred Aberdeen Angus, Red Poll and Indian Brahman, are also maintained. A considerable investment has been made, not only in imported pedigreed cattle, but also in improving water supplies and in pasture improvement in cooperation with the Department of Agriculture. Some 3,000 acres of poor-yielding native-grass pastures have now been established in Wynne grass, and an extension of Pangola grass planting is in hand.

Originally acquired with certain of the bauxite properties in Manchester were 170 acres of citrus groves. New plantings have now increased this area to 450 acres. In the older groves, budding and grafting of more saleable varieties of citrus onto uneconomic varieties has been successfully completed. Aljam has been active in the promotion of a rare variety of citrus called the "ortanique" (a delicious cross between orange and tangerine.) Besides being the largest grower of this unique fruit, the company has established nurseries from which plants of this and other varieties are supplied to growers all over the island.

Another important part of Aljam's agricultural work lies in the leasing of land for basic food production. Recognizing the needs of the neighboring small farmers a total of 2,800 acres has been made available for cultivation by about 2,000 tenants, almost three times the area so allocated when the properties were acquired.

Much work on the land is necessarily seasonal in character, and in 1954 the monthly agricultural payrolls varied between 468 and 599 persons. The average during the year was 497 per month.

**REHABILITATION** of the land is part of Aljam's operations. This green, just outside the town of Mandeville, was one of the first areas mined by the company.



**600-FT PIER** at Port Esquivel is protected by a chain of coral reefs a mile offshore. Over 3-million cu yd of mud and coral were dredged out for the channel.

## Welfare and Housing

Five doctors are available to all employees under a company-sponsored medical plan at nominal charges for treatment and medicine. To provide modern hospital facilities with the best surgical and X-ray equipment, Aljam, in conjunction with the Kaiser Bauxite Co., contributed substantially to the extension of a voluntary hospital in Mandeville. A well-equipped first-aid room, staffed by trained nurses, is maintained at the Kirkvine Works and is visited by a doctor for examinations and dressings daily.

In the field of education, the company has adopted a policy of integration with existing institutions and assistance is being given by the provision of school sites, loans for building, levelling of playing-fields, etc.

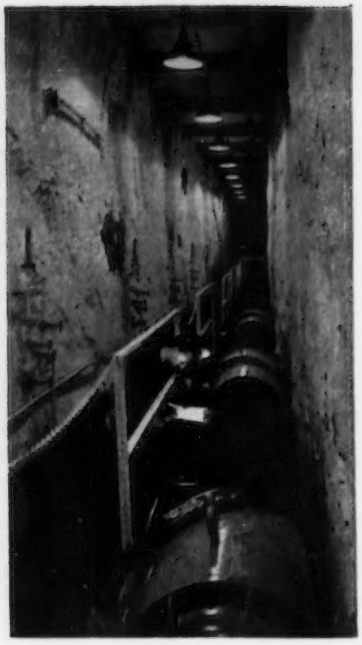
A total of 56 houses have been built for staff and key employees in Mandeville and at Hope, near Williamfield.

When you add to Aljam's extensive agricultural development and its other welfare programs the payroll of 1,000 people employed at mine, plant and port, and the revenue paid to the government of Jamaica, you realize that the mining of bauxite and production of alumina have as much significance for the people of Jamaica as they do for the aluminum industry. Here is a job well done. No matter how you look at it, the mining fraternity can be proud of the job their colleague, Alumina Jamaica, is doing.


## Acknowledgment

For their kind cooperation, generous hospitality and for permission to publish these notes on their operation, *E&MJ* is deeply grateful to Dr. D. A. Bryn-Davies, chairman and managing director; Messrs. S. M. Patterson, works manager; G. C. Vair, secretary; H. L. Carstairs, treasurer; R. E. Crum-Ewing, director and manager of Agricultural Division; R. D. McQuire, production manager; E. F. Frost, chief mining engineer; W. J. Staples, chief engineer and W. Ryle-Davies, public relations director at Mandeville.

**JUMBO-MOUNTED** high pressure nozzles force water into fissures of the Gilsonite ore and send it down a flume to shaft sump. Company built its own jet cars.



**SIX CENTRIFUGALS** in series lift ore from the shaft sump to the surface.

# 72-Mile Pipeline Moves Gilsonite Ore

MINUS 8-IN. ORE is being piped 72 miles from Bonanza, Utah to Gilsonite, Colo. as part of an $18-million project of American Gilsonite Co., Salt Lake City. Ore, suspended in a slurry, travels over an 8500-ft mountain pass and spans a 700-ft river valley and a 600-ft wide wash.

American Gilsonite's is "the first commercial plant to make gasoline from a raw material other than crude oil." Source material is Gilsonite, a natural occurring hydrocarbon. The mineral is shiny black in solid form, appearing brown in its crushed state. Technically an asphaltite, it has a high resin content and very little sulphur. Occurrence is in the upper Uintah sandstones of the Grand Valley.

The company, a joint venture by Standard Oil of California and Barber Oil Co., mines the ore in the Cowboy vein at Bonanza by hydraulic methods, crushes oversize, mixes the slurry and pipes it to Gilsonite, near Grand Junction, where it is dried for entry to the company's refinery. (See *E&MJ* August 1956, p 146, and April 1955, p 120.)

From the 700 tpd ore delivered to the refinery, American Gilsonite produces 275 tons of extremely low-sulphur metallurgical coke, 1,300 bbl of high octane gasoline and large quantities of fuel oil, the latter for use in the plant boilers and refinery.

Customers for the gasoline are found on the western slope of the Rockies and the metallurgical coke is sold to aluminum producers in the Northwest. American Gilsonite notes that production of the coke can be stepped up as demand increases.

## Mining the Ore

Gilsonite occurs in fissures between beds of sandstone, in widths varying between a few inches and 22 ft. Vertical extent has been mined to 1,500 ft in the western end of the basin, and at least one outcrop has been traced for more than 9 miles. Most of the ore has been mined to date by a combination of wet, mechanical and hand methods, cleaned and bagged for shipment to users in the ink, phonograph record, roofing, paint, insulation and linoleum industries.

Early methods of mining Gilsonite (and still followed in some operations) included pick and shovel work, with the ore rolling down an incline and being hauled to the surface in buckets. While it will not burn in a solid state, the dust from ordinary mining operations is highly explosive and the mineral has long had a reputation for being dangerous.

Over the past four years, American Gilsonite has developed mining methods which virtually eliminate all such danger, although full safety precautions are taken at all times.

In developing the Cowboy vein, which supplies ore for the pipeline, AGC sank a deep shaft 850 ft into the vein. Drifts were cut into the narrow vein and the operation worked away from the shaft.

All ore is cut and mined by hydraulic methods, which speed mining and eliminate the dust problem. American Gilsonite builds its own jet cutting cars, which employ high-pressure nozzles mounted on booms. 2,000 psi water, played on the ore surface, enters tiny fissures in the face and breaks the ore, which washes down the drift to a sluice and thence to a sump at the shaft bottom. Large (plus ¾-in) lumps are crushed before entering the sump.

Ore presently being mined in the Eureka No. 1 shaft follows the flume to the No. 3 shaft where it passes over a Symonds screen. Undersize goes directly to the sump and oversize to an 18-in. jaw crusher. Other mining in the Eureka No. 2 shaft, on the far side of the No. 1, is by a cutting machine which also uses water for dust prevention and as a sluice vehicle.

Some 80 men work underground at the Cowboy on a 3-shift, five-day basis. A total of 150 men are employed at

*New Deep Hole Combination Drills*

# 10 FEET OF 3" HOLE EVERY 7 MINUTES

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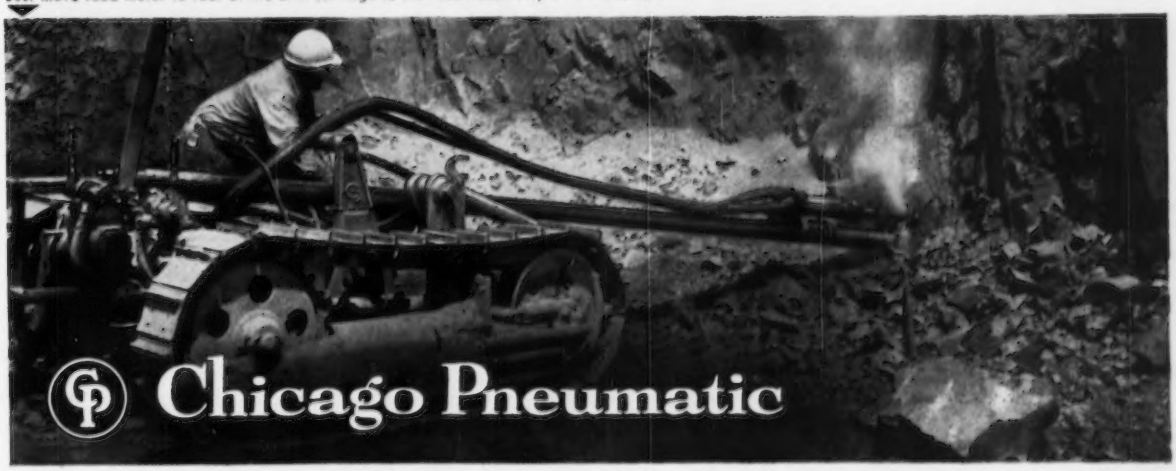
Drill controls stay within easy reach for drilling top holes.

Just move feed motor to rear of the drill carriage to start toe holes only 6" from bottom.




And using 10 foot sectional rods on 40 foot holes total elapsed drilling time was only 34 minutes! We've teamed-up the self-propelled G-800 Tracdril and the CP 4½-inch Reversible Deep Hole Drill to give you the best in mobility and drilling performance. You can inch the Tracdril into tight spots with ease. It takes tough terrain in stride without "bull work" and tows its own compressor up steep grades.

Tops in its class, the CP-450DR Deep Hole Drill hits hard, has powerful rotation that stands crowding. Cleans hole with jet air. With this Tracdril-mounted deep hole rig you can drill toe hole or top hole with equal ease. Ask your equipment dealer for details. *Chicago Pneumatic Tool Company, 8 East 44th St., New York 17, N. Y.*

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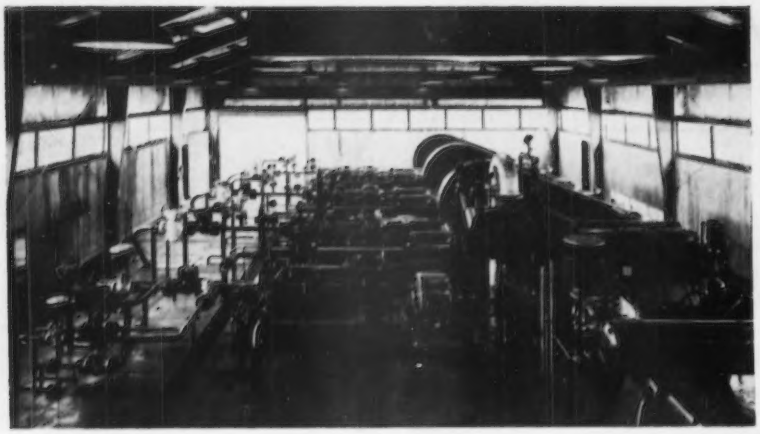


**TWO PISTON-TYPE PUMPS** maintain 2000 psi pressure in the pipeline, third is on standby. Diesel-drive pump supplies water to jet miners at the underground faces.

**RESERVOIR** at 8500 ft is kept ready for emergency flushing of the line.

Bonanza. Most commute from Vernal.

Six centrifugal pumps in series, located in a side drift at the No. 3, lift about 100 tons per hour to the pumping station on the surface.

Very little side- or hanging wall support is necessary in the massive sandstone formation and one observer, watching the glistening black material break and wash down between the dun-colored walls said it looked like the country grocer's trick of lifting coffee beans out of a wooden bin with a scoop.

## Back from Bonanza

Clean ore deposition is not the only favorable condition working for American Gilsonite. Naturally, a hydraulic mining method and pipeline transportation requires lots of water. With the mine near the White River and the refinery on the Colorado, the company has all it needs. In fact, as one official pointed out, nature is merely hurried along. Water traveling through the pipeline reaches the Colorado a little sooner than that which stays in the river and joins the Colorado south of Grand Junction. A 3-million gal reservoir provides a backlog for the pipeline.

Keystone for the pipeline is the pumping station at Bonanza, which receives the minus ¾-in. ore from Eureka No. 3's sump.

The pumping station's heart consists of three electric Wilson-Snyder piston-type positive displacement pumps and one diesel drive pump. Latter supplies the underground jet miners and two of the piston-type pumps (300 hp apiece) maintain 2200 psi pressure in the pipeline, giving a flow rate of 350 gpm. Third piston pump is on standby and provision has been made to cut in water from the diesel pump to flush the pipeline in case of electric power failure.

There are no additional pumping stations along the line. However, AGC believes that it can install boosters along the pipeline, and nearly double capacity, if it is required.

American Gilsonite, in its pilot pipeline tests, established that the slurry had little friction loss and very little corrosion. Optimum size of solids in the slurry proved to be minus 8 mesh. Smaller size decreases breaking down of particles and improves dewatering at the refinery.

The sump of Eureka No. 3 is agitated to keep ore in suspension for the trip to the pump station. On arrival at the surface building, the minus ¾ material is dewatered and run through primary screens and a primary crusher. Secondary screening and crushing takes it down to the required minus 8 mesh. Two banks of Heyl & Patterson cyclones reclaim fines and provide clean water for rerouting to the jet miners underground. Ore is desanded and stored in 200,000-gal tanks for even mixing with water for the trip to Gilsonite, Colo.

The 72-mile, 6-in. dia pipeline is buried 3½ ft. deep, or below the regional frost line, except for its two suspensions, where it is insulated. The line is laid at a reasonably flat slope, except for two miles past the summit of Baxter Pass, where 21 deg downhill slopes were necessary. The rise over the 8500-ft. pass follows an old railway line which was originally constructed to haul Gilsonite, but which was closed with the advent of modern truck haulage.

While, as American Gilsonite points out, there have been no adverse conditions so far, the company is nevertheless prepared for any number of emergencies. The pipeline is designed for continuous flow and can be shut down only after all slurry has taken the 27-hour ride from pumping station to refinery. Besides the standby pump at Bonanza, American Gilsonite has some other backstops. An artificial reservoir is maintained at the peak of Baxter Pass for immediate flushing out of the line by gravity if there is an emergency stop in pumping. The refinery also maintains a back pressure and can flush out from its end if necessary.

E. F. Goodner, president of American Gilsonite Co., in a press conference at the plant early in August, noted that current slurry consists of 35% solids and 65% water, although early tests showed that 40% solids could be piped. And Goodner noted that, with only minor changes in equipment and design he believed that the figures could be reversed, providing a 65%-solid 35%-water slurry to the plant.

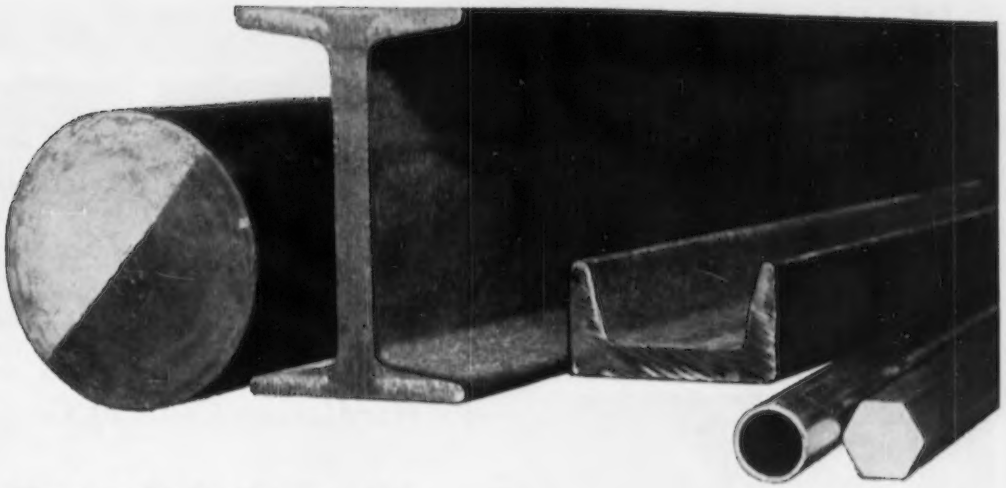
The pipeline was designed by the engineering department of Standard Oil of California and the entire operation was described in a paper presented by Robert K. Bond, of Standard Oil, at the New Orleans meeting of the AIME, February 1957.

At the AGC refinery near Grand Junction, a completely new installation, with all the latest modern improvements in design and equipment, the Gilsonite is dewatered and stockpiled.

The company notes that spraying of the stocks with water seems to be the best weapon against dust loss. Other methods, including plastic covers and an oil spray, didn't work.

After dewatering, the clean ore enters a rotary hearth on its way through the separation process which provides first a "green" coke, and then the pure carbon for potline anodes and the high-grade gasoline.

At the press conference, Goodner also hinted at development of what he called "Gilsochemicals", a possible result of current research by Standard Oil and American Gilsonite Co.



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The 1500-lb cutting head on the sand sucker shown at left gets terrific wear as it turns 30 rpm while digging 17 ft deep into sea sands of Florida to mine rutile, ilmenite, zircon and other heavy minerals. Once a week, usually Saturday morning, a regular member of crew who has had little or no previous welding experience rebuilds the head in four or five hours, using 20 to 25 lb of electrodes.

Most wear is not on the five 1-in. steel blades but rather on the three digging teeth along leading edge of each blade. Teeth are of manganese steel, 3 in. wide, 8 in. long and taper from 2½ in. to rather sharp edge. Outside edge of teeth, where friction is greatest, wears most.

When cutter head becomes worn beyond advisable field repair it is replaced and completely rebuilt in shop, about once every six months. Actually it takes less man-hours to rebuild in field every week than to replace.

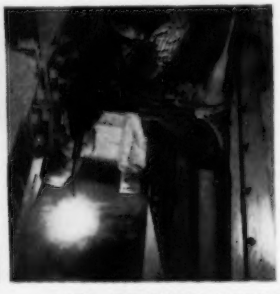
A 250-amp Hobart gas drive welder is used with $\frac{5}{32}$-in. or $\frac{3}{16}$-in. Tufanhard "600" electrodes, welding at 130 to 200 amp depending on electrode size and cable length.

On jet piercers used at a Minnesota taconite pit, reamer, stem and kelly extension are hardfaced with Haynes Stellite alloy No. 6 rod. Here the parts must resist abrasion of the very hard, lean siliceous magnetite ore formation as well as bit temperatures of 800 deg F.

Alloy is applied manually in one pass using either oxy-acetylene or metallic arc. Depositing a ⅛- to ¼-in. thickness along the six teeth on a reamer takes about an hour. Parts are built up about 10 times, extending life almost six times.

At another taconite operation, reamer life on a Linde piercer is extended with 20 build-ups giving each 80 to 100 ft of hole. Kelly extension is given four build-ups, each lasting for 5,000 ft of hole. Blowpipe is hardfaced too.

At a large underground lead mine in Missouri, Haynes Stellite alloy No. 6 is also used. Over 30 bearing surfaces on Joy



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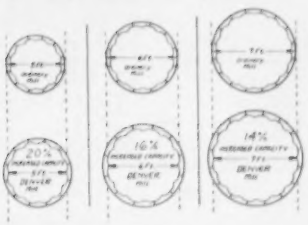

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DECO ENGINEER — DENVER EQUIPMENT 24 HOUR SERVICE COMPANY

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**1400 Seventeenth St. • Denver 17, Colorado**

DENVER • NEW YORK • CHICAGO • VANCOUVER • TORONTO
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# OPERATING IDEAS *(Continued)*

loaders and shuttle cars are protected. Some parts operate while completely covered by wet abrasive mud from limestone, silica sand and galena without ever being lubricated.

In most instances, the hardfaced areas replace tapered bearings. Some would last only three weeks but now when built up with hardfacing they stay in service for over a year.

On the loader, No. 6 rod is applied to two bearing areas on inside of track rollers and corresponding areas on outside of roller axles (left above). On the block and stud of arm pivot assembly (center above) hardfaced surface showed only 0.008-in. wear after two years of use. Other parts protected are: circumference of gathering head disk assembly (right above); idler take-up sprockets; track roller frames; and foot shaft and rollers.

On shuttle cars, drive shaft bearing life has been increased to equal service life of car before reconditioning. Bearing wore out in as little as one month prior to hardfacing. Now it lasts one to three years.

Parts are hardfaced at large underground maintenance site where operators use both oxy-acetylene and metallic arc methods. Performance of parts has persuaded engineers to use hardfacing even on some new replacement parts.

Semi-automatic method can sharply reduce hardfacing time and cost, according to Stoody Co. It is said to be fully proven —combining versatility of manual method with speed of automatic feed and giving deposition rates of up to 20 lb per hour, open arc welding with no flux, complete visibility of arc, no stub end losses, no time wasted in changing electrodes, and lightweight equipment that is easier to handle.

Machine (shown in right center photo on previous page) feeds continuous coiled wire through a flexible cable to welding nozzle. Stoody wires are supplied in a number of different analyses for all types of build-up and hard-facing jobs from simple build-up of manganese parts to TC overlays.

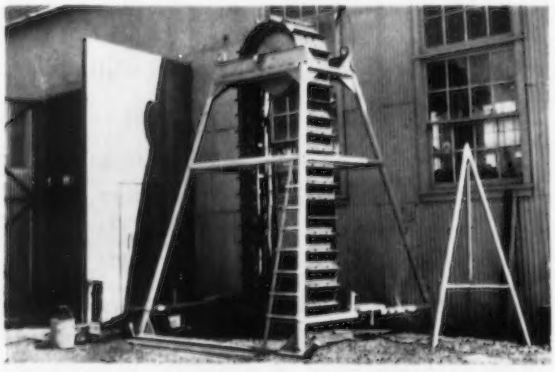
Metal spraying or metallizing is another versatile method. Recently developed powder guns, especially advantageous for hardfacing, use no compressed air and have deposit efficiencies of over 90%. According to Metco News, periodical of Metallizing Engineering Co. Inc., there are a wide variety of suitable alloys and even ceramics to meet hardfacing requirements.

## Jig Speeds Welding Of Treads

BUILD-UP WELDING of worn crawler tractor treads has been speeded and simplified at Copper Cities Div., Miami Copper Co., Miami, Ariz. Heavy steel pipe frame devised by L. M. Trice, master mechanic, and Homer Campbell, tractor shop foreman, eliminates need to remove treads from track proper.

On top, simple U-slot in each side channel receives axle of track sprocket wheel. Fully assembled track hangs from sprocket and is weighted down by second sprocket wheel (shaft removed). Skids on bottom and eyes on top make moving easy. Short ladder gives access to sprocket wheel bearings.

Welder sits on seat on lower crossbar and pulls each tread down into welding position in front of him.



## Repairing Wheels Eased by Jig

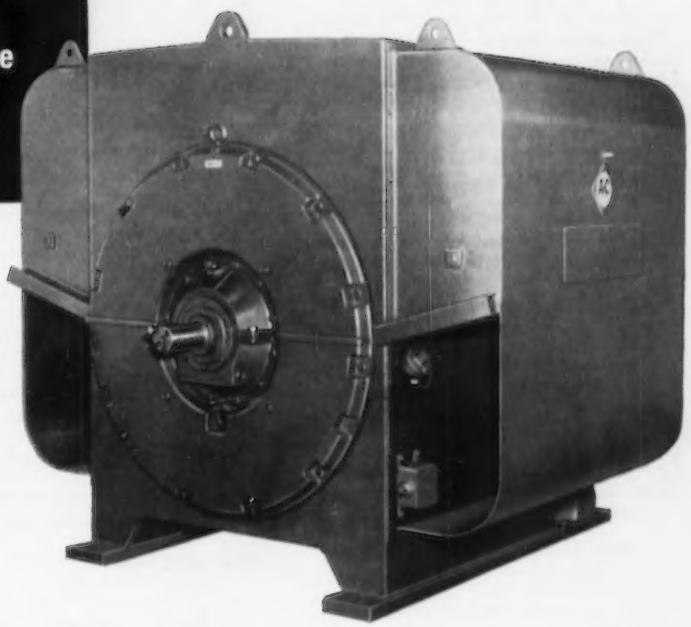
BUILD-UP AND GRINDING of mine locomotive wheels is done more easily at International Minerals & Chemical Corp.'s potash mine near Carlsbad, N. M., with locally developed jig. Claude Cole, machine shop foreman, is designer.

Flat spots and normal tread wear used to mean bringing wheels to surface where tires were cut off and new ones sweated on—a difficult, expensive job and wasteful of material in old tires, according to *Internationalite*, monthly company magazine.

Now worn treads are first built up by electric welding and then ground to proper shape—all without dismounting wheels from axle or tire from wheel. Wheel and axle assembly is supported by bearing blocks on jig frame while rotated by electric motor and V-belt. Slide adjustment permits correct grinding regulation. Design also appears to lend itself to automatic welding or metallizing.

# Eliminate costly enclosures with Allis-Chalmers weather-protected MOTORS

## Modern features
**cut operating, maintenance expense . . . give MORE dependability**



**Here's a newly designed line** of Allis-Chalmers weather-protected motors with the ability to "take" outdoor conditions. This means no expensive protective enclosures are needed . . . a big saving in plant or installation building costs.

Designed to meet defined NEMA requirements, these motors incorporate many important features which assure dependable outdoor operation:

- **Ventilating System** — Low velocity intake, vertical lift, change of direction and high velocity discharge of ventilating air keep rain, snow, sleet, dust and dirt out of vital parts.
- **Removable Air Ducts** — To facilitate inspection and maintenance of interior air passages, air intake ducts are designed for quick removal.
- **Stator Assembly** — Removable as a unit, it simplifies maintenance and minimizes downtime.
- **Split Sleeve Bearings** — Capsulized design permits access to motor interior without disturbing the bearings or their enclosures. Positive vapor seal is used on high-speed motors. Antifriction bearings are available for slow speed motors.
- **Proven Insulation** — Famous Allis-Chalmers insulation systems (Class A and B) are available. And, for extreme temperatures, or where high resistancé to abrasion and moisture is required, Allis-Chalmers can provide the revolutionary *Silco-Flex* system.

*Silco-Flex* is an Allis-Chalmers trademark.

**THIS DESIGN** available in ratings from 250 to 900 hp. Other designs in larger horsepower ratings are also available. Contact your A-C sales office or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin. Ask for Bulletins 51B8606A and 05B7894.

A-5292

# ALLIS-CHALMERS

# PERSONALS

**Earl L. Bilheimer** has been appointed resident manager of Meramec Mining Co., recently organized under joint ownership of St. Joseph Lead Co. and Bethlehem Steel Co. to develop and mine a huge deposit of magnetite and hematite near Sullivan, Mo. Preparations are now being made to start the first shaft on Sept. 1, 1957, which will be about 3,000 ft deep. Mr. Bilheimer has been with St. Joseph Lead Co. at Bonne Terre, Mo., since 1922, having served mostly in operating supervisory capacities but more recently as manager of the Employees' Relations Department. He will continue to maintain headquarters at Bonne Terre until sometime this Fall when the Meramec Mining Co. expects to establish offices at the plant site near Sullivan.

**Bilheimer**

**Joseph P. Lyden,** chief geologist for the Eagle-Picher Co. for many years, comes up to his final retirement date on September 30. **Douglas Brockie,** who has been senior geologist in the Tri-State District, is being promoted to chief geologist for the company's domestic operations and exploration. Succeeding Mr. Brockie will be **Richard C. Lundin,** who has been working with Mr. Brockie in the field. **Robert A. Chadwick III,** who has been working on special projects in the Tri-State Field, will take over additional exploration work under Mr. Brockie. In the Illinois-Wisconsin Area operations and explorations, **William E. Arnt** has recently been promoted to senior geologist.

**Sidney L. Groff** has joined the staff of Montana Bureau of Mines and Geology, Butte, Mont., as geologist and head of the groundwater branch.

**W. W. Little,** mine superintendent, has been named general superintendent of the Copper Queen Branch of Phelps Dodge Corp., with headquarters at Bisbee, Ariz. **H. D. Clark,** formerly assistant mine superintendent of the Copper Queen Branch, has been promoted to mine superintendent, succeeding Mr. Little.

**J. Wilfred Spooner** has been named minister of mines, the eighth since the department was established as a separate ministry of the Ontario government in 1919. He was sworn into office July 18. Mr. Spooner replaces **Philip T. Kelly** who was appointed to the cabinet in 1952 following his election the previous year.

**Lowell B. Moon** has been named development manager of Kennecott Copper Corp., directing engineering phases of the company's exploration activities, with offices in New York City. Following his graduation in geology from the University of Minnesota in 1930, Mr. Moon had extensive experience in mining geology in the southwestern states, Bolivia and Chile. In 1939 he joined the U. S. Bureau of Mines, where he was engaged in examination and evaluation of mineral deposits and directed exploration activities. For five years he headed the Mining Division of the Bureau and later the Minerals Division. He joined the exploration staff of Kennecott in 1952 as district geologist for the northwestern states and Alaska.

The Society of Mining Engineers of the American Institute of Mining, Metallurgical and Petroleum Engineers, has announced that **Stanley D. Michaelson,** of Salt Lake City, chief engineer, Western Mining Division, Kennecott Copper Corp., has been nominated for 1958 president of the Society. He will also serve as a director of AIME. The current president of the Society is **Elmer A. Jones,** of Bonne Terre, Mo., manager of Southeast Missouri Division, St. Joseph Lead Co. Mr. Jones recently was nominated by the Society to be an AIME director

**L. F. Ivanhoe,** geologist and geophysicist, has established a technical consulting service, domestic and foreign, in Bakersfield, Calif.

**Paul Weir,** chairman of the board of Paul Weir Co., Inc., a consulting engineering organization, has been elected to honorary membership in England's Institute of Mining Engineers. Cited for "distinguished attainments" in mining, Mr. Weir flew to London to receive his award July 24. He is one of only four Americans in recent years to win election to the Institution. The Weir company currently is engaged in Turkey's largest industrial project—the development of coal resources to feed their growing steel industry.

**Weir**

**Dr. Alex Stewart,** formerly director of research for National Lead Co., and supervisor of the company's atomic energy activities, has been elected president and general manager of R-N Corp., owned equally by National Lead and Republic Steel Corp. C. M. White, Republic's chairman, is chairman of the board of the new corporation. Vice presidents are: Alfred H. Drewes, vice president and director of National Lead, and Peter Robertson, Republic's vice president in charge of research and planning.

**Stewart**

Joy Manufacturing Co., has announced the affiliation of **John P. Courtright** with the company as a consultant on metal mining, quarrying, strip mining, and construction problems. Mr. Courtright was formerly president of Marion Power Shovel Co., and has been associated for more than 30 years with the mining and quarrying industries in the U. S. and abroad. He is a member of AIME, and has been chairman of the Manufacturers' Division of American Mining Congress.

**Courtright**

**Bernard Witkin,** chief chemist of the Southern Rhodesian Government Metallurgical Laboratory in Salisbury, has left for the United States for a six months' study of the latest processes in extracting minerals from ores. He will visit mines and chemical plants throughout the U. S. on a tour sponsored by the International Co-Operative Administration.

**Eugene C. Anderson,** mining engineer recently retired from the New Mexico Bureau of Mines and Mineral Resources, has opened a consulting office in Socorro, N. M.

**Charles Will Wright** has recently completed a job for the Bureau of Mines bringing up to date reports he started over 2 years ago on "What the American Mine Investor Wants to Know About the Latin American Republics." These reports will be published as an Information Circular by the Bureau of Mines.

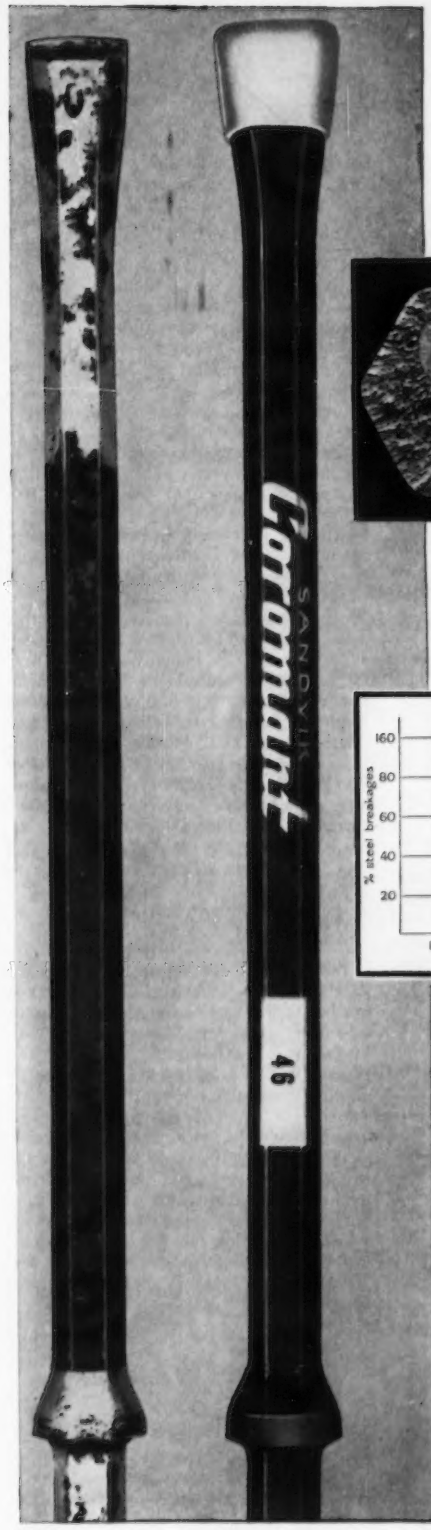
**Ward Brown,** who had been mine captain at the Leonidas underground mine near Eveleth, Minn., for North Range Mining Co., is now with the Rhude & Fryberger organization in the Cuyuna Range.

**J. E. Bemis,** Keewatin, Minn., assistant superintendent at the Mesabi Chief mine of the M. A. Hanna Co., has been promoted to assistant superintendent of all Hanna Co. mines on the Cuyuna Range.

**Martin E. Lorntson,** Silver Bay, has been appointed a shift foreman for Reserve Mining Co. at their yards and docks.

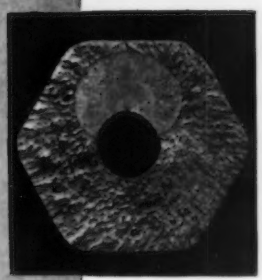
**Robert H. Winters,** Minister of Public Works for Canada from 1953 until June of this year, has been appointed president of Rio Tinto Mining Company of Canada, Ltd.

**Dr. Charles W. Haynes** has been named associate professor and head of the Metallurgical Engineering Department at Montana School of Mines. He was associate professor of metallurgy at the University of Nebraska. He is a member of the AIME.




OSS 76A

# SR—the new Sandvik Coromant treatment gives steels 50% longer life

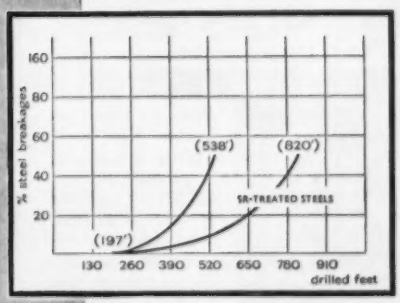


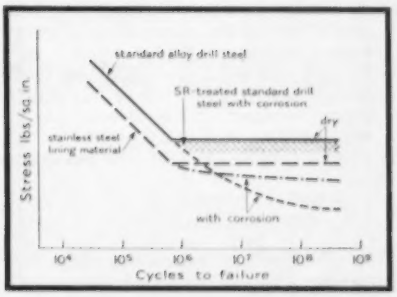
Corrosion invariably lessens the fatigue strength of drill steels and causes earlier breakages. The breakages start from corrosion craters and indentations, around which ever-widening areas of worn surfaces are formed. (See picture of cross-section.)

The main cause of corrosion is moisture—so effective protection of the steels against moisture during both storage and actual drilling eliminates corrosion and gives longer life to the steel. This protection is given to Coromant integral steels by the SR treatment, a new exclusive Sandvik feature.

## PRACTICAL TESTS GIVE CONCLUSIVE PROOF

The diagram on the left shows clearly that SR-treated steel rods have a 30%-50% longer working life than those of untreated steels. Figures are based on extensive practical tests, which resulted in an average drilling depth of 820 ft. for SR-treated steels as against 530 ft. for untreated steels, before rod breakage.




## HOW SR TREATMENT PREVENTS CORROSION

SR treatment is a new method of surface protection developed by Sandvik. It protects both the wall of the flushing hole and the outer walls from corrosion by a thin but strongly adhesive layer. The fatigue properties of the steels therefore correspond to those valid under dry conditions. On the wall of the centre hole, usually subjected to water flushing, the SR layer is everlasting, and *does not decrease the diameter of the flushing hole*. This is a distinct improvement on the old means of coating the centre hole with stainless steel, which lessens the diameter of the flushing hole, prevents full and effective flushing, and thus diminishes the drilling rate. Moreover, stainless steel has a lower fatigue strength than standard alloy drill steel.

Sandvik Coromant drill steels have been closely developed together with Atlas Copco rock drills. This drilling combination has for years been the most widely used in the world.

Sandvik Coromant integral steels, extension steels and detachable bits are supplied by Atlas Copco, who, in their own field, are the world's largest manufacturers of rock drills. For further information please contact: **U.S.**—Atlas Copco Pacific, Inc., 930 Brittan Avenue, San Carlos, California, Atlas Copco Eastern Inc., P.O. Box 2568, Paterson 25, N.J. **CANADA**—Atlas Copco Canada Limited, Montreal Airport, P.Q. **MEXICO**—Atlas Copco Mexicana S.A., Apartado Postal 56, Torreon, Coahuila.

**Atlas Copco**

*Manufacturers of Stationary and Portable Compressors, Rock-Drilling Equipment, Loaders, Pneumatic Tools and Paint-Spraying Equipment*

# PERSONALS (*Continued*)

**Robert Lord** was recently honored on his four decades of service with Southwestern Engineering Co. and was presented with the company's first 40-year service pin. Mr. Lord, who is head of the metallurgical laboratory, has developed major innovations in flotation extraction processes for industry. He is a member of AIME and has in past years prepared special reports and articles for many leading publications.

Lord

**Ralph S. Archibald,** president of North Range Mining Co., has retired, but will continue as a director. He has been succeeded by **Frank P. Book** of Detroit.

**Horace Y. Bassett,** executive vice president of Calumet & Hecla, Inc., has been elected president and chief executive officer, succeeding **E. R. Lovell,** president for the past 13 years, who has been named chairman of the board and the executive committee. Mr. Bassett became a part of the organization in 1942 when Calumet & Hecla acquired the Wolverine Tube Co. of which he was factory manager. In 1944 he was made general manager of that division and a vice president of Calumet & Hecla. In 1956 he became executive vice president.

**Richard C. Klugescheid,** formerly general council for the Kennecott Copper Corp., has been elected president of Mesabi Iron Co., succeeding **Erle V. Daveler** who has become chairman of the board.

**F. E. Patton,** assistant mine superintendent of Noranda Mines, Ltd., has been appointed manager of Pamour Porcupine Mines, Ltd., at Pamour, Ontario, to succeed **D. E. Schmitt,** who has been promoted to assistant manager of the Horne copper mine, also operated by Noranda Mines, Ltd., at Noranda, Quebec.

**Lenox Rand** is now with the U. S. Bureau of Mines at Minneapolis where he will conduct studies of mineral industries.

**Oliver A. Axelson,** formerly mining captain for Pickands, Mather & Co., at the Albany mine, is now with Snyder Mining Co. as mining captain at the recently reopened Godfrey underground mine, previously operated by Oliver Iron Mining Division.

**Priya Chakrabandh,** mining machinery inspector of the Royal Department of Mines, Thailand, has completed a two-month visit to the Lake Superior area. He was particularly interested in mine safety and safety protection devices.

**Hugh H. Harrison,** president of Pacific Isle Mining Co., has been made a trustee of Midwest Research Institute of Kansas City, Mo.

**Norman M. Sherman,** supervisory trainee at the Sherman mine plant near Chisholm, Minn., has been appointed a plant foreman at the Sherman crushing and screening plant.

**Henry R. Colen,** formerly geological-mining engineer with International Minerals & Chemical Corp., in Columbia, Tenn., has been named general manager of Minquim Internacionales, S. A. de C. V., a new subsidiary of the same company, with headquarters in Monterrey, N. L., Mexico.

**Ian K. MacGregor** has joined Climax Molybdenum Co. as vice president-eastern operations. He had been general manager of Manning, Maxwell & Moore, Inc. in Stratford, Conn. He was educated in Glasgow, Scotland.

**Paul E. McDaniel,** Houston, Tex., has been named board chairman, and **John V. Persons,** Midland, Tex., president of Ambrosia Minerals, Inc. which operates manganese mine and mill in Arizona and New Mexico. Mr. McDaniel also is president of the Brazos Engineering Co.

**Finn B. Domaas** has joined the staff of *Engineering & Mining Journal* as assistant editor. A graduate from the City College of New York with a BA degree in geology, he was an active member of the Christian Association and the Geological Society. Mr. Domaas has done extensive traveling in Europe as well as throughout the United States. He comes to *E&MJ* following a year's association with the Royal-Globe Insurance Group.

Domaas

**William B. York,** director of maintenance at Hill Air Force Base near Ogden, Utah, has resigned to accept the post as chief industrial engineer of the Nevada Mines Division of Kennecott Copper Corp.

**Robert L. Rigsby,** accounting manager at American Smelting & Refining Co.'s Garfield reduction plant, has been named accounting manager for Southern Peru Copper Co., Toquepala, Peru. **L. K. Nickolson,** formerly chief accountant, succeeds Mr. Rigsby. **Robert M. McGeorge** has been promoted from ore buyer of Utah department to assistant manager of southwest department of AS&R at El Paso, Tex.

**Samuel Riker Jr.,** treasurer for several years, has been elected secretary of the New Jersey Zinc Co. He will retain the office of treasurer.

**Hubert D. Keiser,** chief of the Bureau of Mines Branch of Rare and Precious Metals until his retirement last year, has been honored by the Department of the Interior with its Meritorious Service Award and Silver Medal. He is now with the National Academy of Science in Washington. For about 10 years beginning in the spring of 1927, he was on the editorial staff of *Engineering & Mining Journal* and *Metal & Mineral Markets*.

**Roger L. Tenney,** mining engineer, has recently assumed duties with the Health and Safety Activity of the Bureau of Mines with headquarters in Duluth, Minn. A graduate of the Michigan College of Mining and Technology at Houghton, he was employed by the Braden Copper Co., Rancagua, Chile, as assistant chief mining engineer and assistant mine foreman until he joined the Bureau of Mines.

**Richard E. Thompson,** assistant superintendent of the South Agnew and Morton mines, was promoted to superintendent at those properties. **Lloyd M. Bredvold,** former superintendent of the two mines, was transferred to the Pierce Group in North Hibbing, Minn., (formerly the Norpac). He will also be in charge of the Weggum mine. **Milton Englund,** assistant superintendent at the South Agnew and Morton mines, has been transferred to the Pierce Group and Weggum in that capacity. **Wilmer Johnson** and **LeRoy Anderson** were transferred to the Pierce Group as master mechanic and electrical supervisor respectively. **Alvin Grinde,** mechanical engineer, has been made master mechanic at the South Agnew and Morton mines, M. A. Hanna Co.

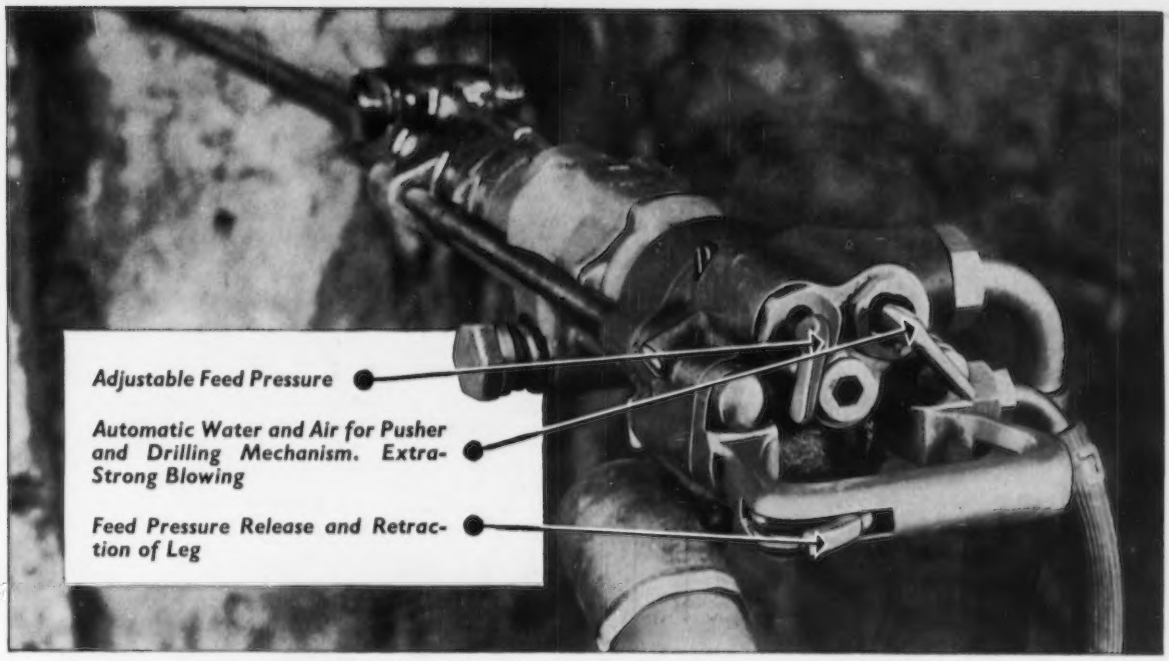
**Frank Rahne,** master mechanic for M. A. Hanna Co. of the west Cuyuna shops, has been transferred to the Moose Mountain iron mine of the Lowphos Ore Co. in Ontario. He has been succeeded by **Harold Ehlers,** formerly at the Portsmouth mine.

**J. E. Schleske,** assistant superintendent at the Carmie mine of Pickands, Mather & Co., has been promoted to superintendent, succeeding **L. T. Lang** who has been transferred to the West Hill mine as superintendent.

Wenner

Nordness

**Conrad Wenner** and **Harold Nordness** are new appointees to the sales staff of Goodman Manufacturing Co. Both men are graduate mining engineers, Mr. Nordness from the University of North Dakota, Mr. Wenner from the Colorado School of Mines.


Adjustable Feed Pressure
Automatic Water and Air for Pusher and Drilling Mechanism. Extra-Strong Blowing
Feed Pressure Release and Retraction of Leg

# THE ATLAS COPCO LION— A REVOLUTIONARY NEW ROCK DRILL

### All controls under one hand

The Atlas Copco Lion is the first drill to have all the valves which operate the drill under the control of one hand. *Full and easy control without having to move the hand from the backhead!* All the controls have been designed so that they are well protected. While using them the operator's hand is never near the wall or roof of the drift. The Lion is the first pusher leg drill with controls placed for drifting.

### Retractable leg saves time

When the leg has to be moved the feed pressure is easily released by squeezing the hand grip. By further pressure on the grip the leg retracts automatically. When the leg is in the new position suitable for continuous drilling, retraction stops and the feed pressure comes back by loosening the grip of the hand. *All this can be done while the drill is still running.*

This new idea of a retractable leg enables quicker repositioning of the leg and reduces the number of steel changes, thereby increasing footage per manshift. When drilling high holes it is now far easier to alter the position of the leg more frequently in order to maintain an optimal feed angle and feed pressure.

### Packed with power for deep holes

The Lion has a drilling rate at least 30% higher than other rock drills of the same weight. Furthermore, it can maintain its high speed *even when drilling deep holes.* This means quickly drilled deep hole rounds and a faster advance. The Lion also reduces *to a minimum* the gauge wear of the bits in abrasive rock. And owing to the ease with which the feed pressure is released and brought back into action, the Lion is a *handier* drill to work with in fissured rock.

### Sandvik Coromant—the steel for the Lion

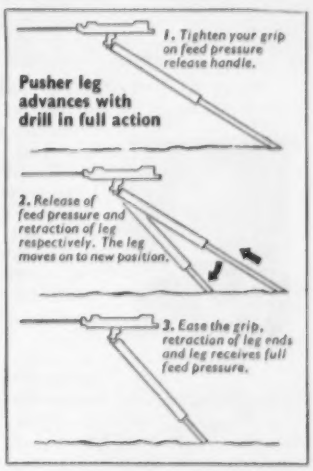
All Atlas Copco drills—and this goes for the Lion too—have been developed from the earliest stages with Sandvik Coromant tungsten-carbide-tipped integral steels and detachable bits. This combination pioneered tungsten carbide drilling in the early forties. No drill or steel developed separately could ever give such equivalently high performances as this drilling combination. Today it is the most widely used in the world, responsible for drilling more than 1,000 million feet annually.

For further information on the Atlas Copco Lion rock drill, and details of sales and service, please contact:

**U.S.**—Atlas Copco Pacific, Inc., 930 Brittan Avenue, San Carlos, California, or Atlas Copco Eastern Inc., P.O. Box 2568, Paterson 25, N.J.

**CANADA**—Atlas Copco Canada Limited, Montreal Airport, P.Q.

**MEXICO**—Atlas Copco Mexicana S.A., Apartado Postal 56, Torreon, Coahuila.


1. Tighten your grip on feed pressure release handle.
Pusher leg advances with drill in full action
2. Release of feed pressure and retraction of leg respectively. The leg moves on to new position.
3. Ease the grip, retraction of leg ends and leg receives full feed pressure.

**Atlas Copco**

D5574A

*Manufacturers of Stationary and Portable Compressors, Rock-Drilling Equipment, Loaders, Pneumatic Tools and Paint-Spraying Equipment*

# PERSONALS (*Continued*)

## OBITUARIES

**Dr. Philip B. Bucky,** 58, Professor of Mining at Columbia University, died Aug. 8 in New York City. In 1932, after experiments related to mining and construction, Prof. Bucky invented a device which substituted centrifugal force for gravity to test behavior of models under stress. Engineers were able to use the unit to determine accurately stresses of gravity beneath earth's surface, and to apply this information to the construction of heavy-duty supports such as bridge girders, mine pillars and dams.

He joined the Columbia staff in 1929 as assistant professor and was an executive officer of its School of Mines from 1946 to 1952. Dr. Bucky authored "Mining by Block Caving" in 1945, held patents on mining methods and ground-support devices, and was member of the AIME, Mining and Metallurgical Society, and the American Physical Society.

**Stacy H. Hill,** retired district manager, Salt Lake City, Utah, for Ingersoll-Rand Co., died July 8. He was graduated from Michigan College of Mines, Houghton, in 1909.

**Ernest T. Weir,** 81, former chairman and chief executive officer of National Steel Corp., died June 26. A veteran of nearly 67 years in the steel business, Mr. Weir formed National Steel Corp. in 1929, which became one of the nation's largest steel producers.

**Kershaw Harms,** 58, vice president of American Smelting & Refining Co., died suddenly July 12. An AS&R employee for 40 years, Mr. Harms served the company in many capacities, including 14 years as manager of its Perth Amboy, N. J., plant. Since 1954, he had been general manager of the Federated Metals Division, being made vice president in charge of the division in April of this year.

**Walter C. Kerrigan,** 64, assistant to the president of the International Nickel Company of Canada, Ltd., and its U. S. subsidiary, International Nickel Co., Inc., died July 16 at the Middlesex General Hospital, New Brunswick, N. J., after an illness of several months. Mr. Kerrigan joined the Nickel Sales Department of International Nickel Co., Inc. in 1930. In 1933, he was appointed assistant manager of the department, and in 1946 became manager. He was elected vice president of International Nickel Co., Inc. in 1947, and vice president and general sales manager in 1952, and had served as assistant to the president of that company and the parent company since May 1954.

**Kerrigan**

**Roger W. Straus,** 65, ex-chairman of the board of American Smelting and Refining Co., died July 28 in Liberty Loomis Hospital, Liberty, N. Y. after having been stricken with a heart attack the previous day. Mr. Straus joined AS&R in 1914. He was named a director in 1916 and became assistant to the president in 1920. He was elected president in 1941 and served as chairman of the board from 1947 until April of this year. He was elected Chancellor of the New York State Board of Regents in March after having served as a board member for 10 years.

**Straus**

Mr. Straus was also a director of the General Cable Corp., the New York Life Insurance Co. and Revere Copper & Brass. Aside from his business and educational activities, he was active in religious and political affairs, and was a champion of religious tolerance. Mr. Straus was a founder and Jewish co-chairman of the National Conference of Christians and Jews.

**I. H. Wynne,** 68, consulting engineer with offices in San Francisco, died suddenly July 11, while on a business visit to Duluth, Minn. From 1944 to 1954, Mr. Wynne was associated with the Reserve Mining Co. as plant designer for their taconite operations; and more recently served as plant design consultant for large low-grade iron ore projects in eastern Canada.

**John P. Birch,** 50, assistant superintendent of the Duluth, Missabi & Iron Range railway in charge of operations in the Iron Range division, died July 12. Mr. Birch joined DM&IR railway in 1926.

**Walter R. Anyan,** 60, secretary of the New Jersey Zinc Co., died on July 25 at the Greenwich, Conn., hospital. Mr. Anyan started his employment with the company in 1915 and progressed through the organization to become secretary in 1948. He was a graduate of Polytechnic Institute of Brooklyn.

**Edward L. Ralston,** 70, mining engineer of Redding, Calif., died following a heart attack July 9 near Winnemucca, Nev. He was with the Glidden Co. for 30 years, as engineer in charge of mining for the company's divisions in Shasta County, Calif. and Lander and Nye Counties, Nev. He also was manager of Glidden's pigment division, Oakland, Calif. from 1940 to 1953, when he went to Shasta County to reopen the Bully Hill Mine. He retired from Glidden last September. Mr. Ralston attended Montana School of Mines and received his degree in mining from the University of Utah in 1910. He was superintendent of the old Alsoma Mine at Butte, Mont., until 1927, when he moved to the West Coast.

**W. J. Dick,** 74, widely known in Western Canada as a mining and fuel authority, died in Edmonton, Alberta, July 7. Mr. Dick was noted as a mining consultant. He also was a member of the Alberta Power Commission and a director of Inland Cement Co., Ltd.

**Keith J. Moody,** 52, superintendent of the Open Hearth Division at the Duluth plant of American Steel & Wire Co., died at Salt Lake City on June 5. Mr. Moody was there to attend a meeting of U. S. Steel's Open Hearth Committee at the Geneva works near Provo, Utah.

**Reginald Dudley Baumann,** 66, manager of the *South African Mining Journal* until his retirement in 1945, died June 29 in Johannesburg.

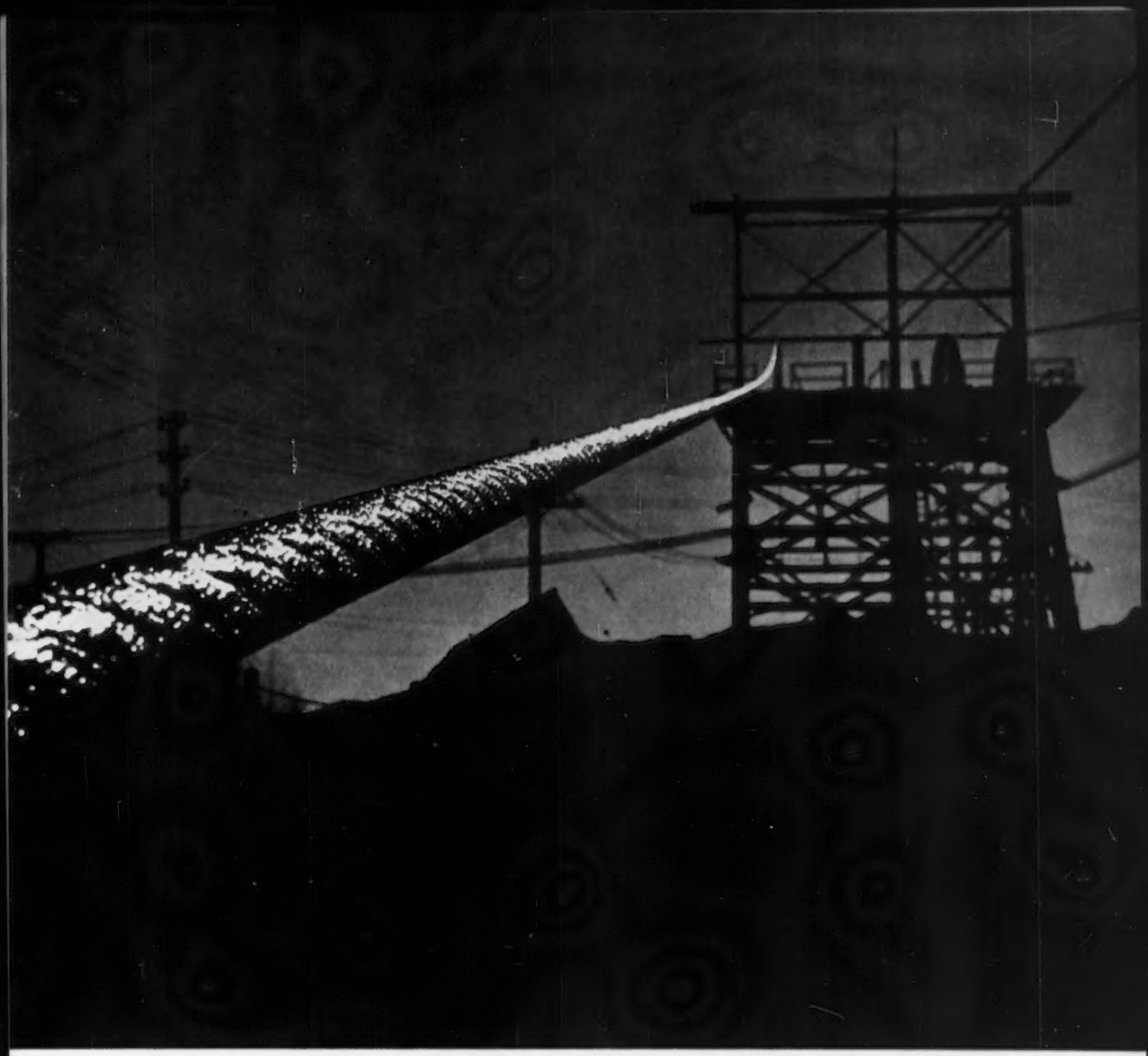
**F. Ray Peterson,** 55, assistant to the president of R. G. LeTourneau, Inc., died July 29 following a heart attack in Longview, Tex.

**H. J. Rahilly,** 68, former manager of mines for the Anaconda Co. in Butte, died July 25 in Whittier, Calif., following a heart attack. A graduate of the School of Mines, University of Minnesota in 1911, Mr. Rahilly started his career in the iron country of Northern Minnesota and Michigan. Later he worked in Mexico, Alaska and Arizona before coming to Butte in 1917. He retired in 1951.

**George H. Garrey,** 82, mining geologist, died following a heart attack at his home in Denver, July 23. After graduation from the Michigan College of Mines, he became a geologist for the USGS. Later he became a consulting geologist and served many mining companies in Colorado and in the Southwest. He owned mining interests in the Summitville and Gunnison areas of Colorado.

**David F. McCormick,** 69, southern Oregon mining consultant and engineer, died July 14 after a short illness. He received his civil engineering degree at the University of Texas in 1908 and in 1910 he received a degree in mining and metallurgy at the Colorado School of Mines. Between 1912 and 1915, he operated Aquacate Mines near San Jose, Costa Rica, and from 1915 to 1922 he managed Matahambre Copper Mines in Cuba. He moved to Medford, Ore., in 1933 to manage Sterling mines and Yara Engineering Co. From 1941 to 1946, Mr. McCormick managed quicksilver mines near Winnemucca, Nev., and served as mining consultant in Oregon from 1946 until his death.

**McCormick**



## WIRE ROPE AT WORK

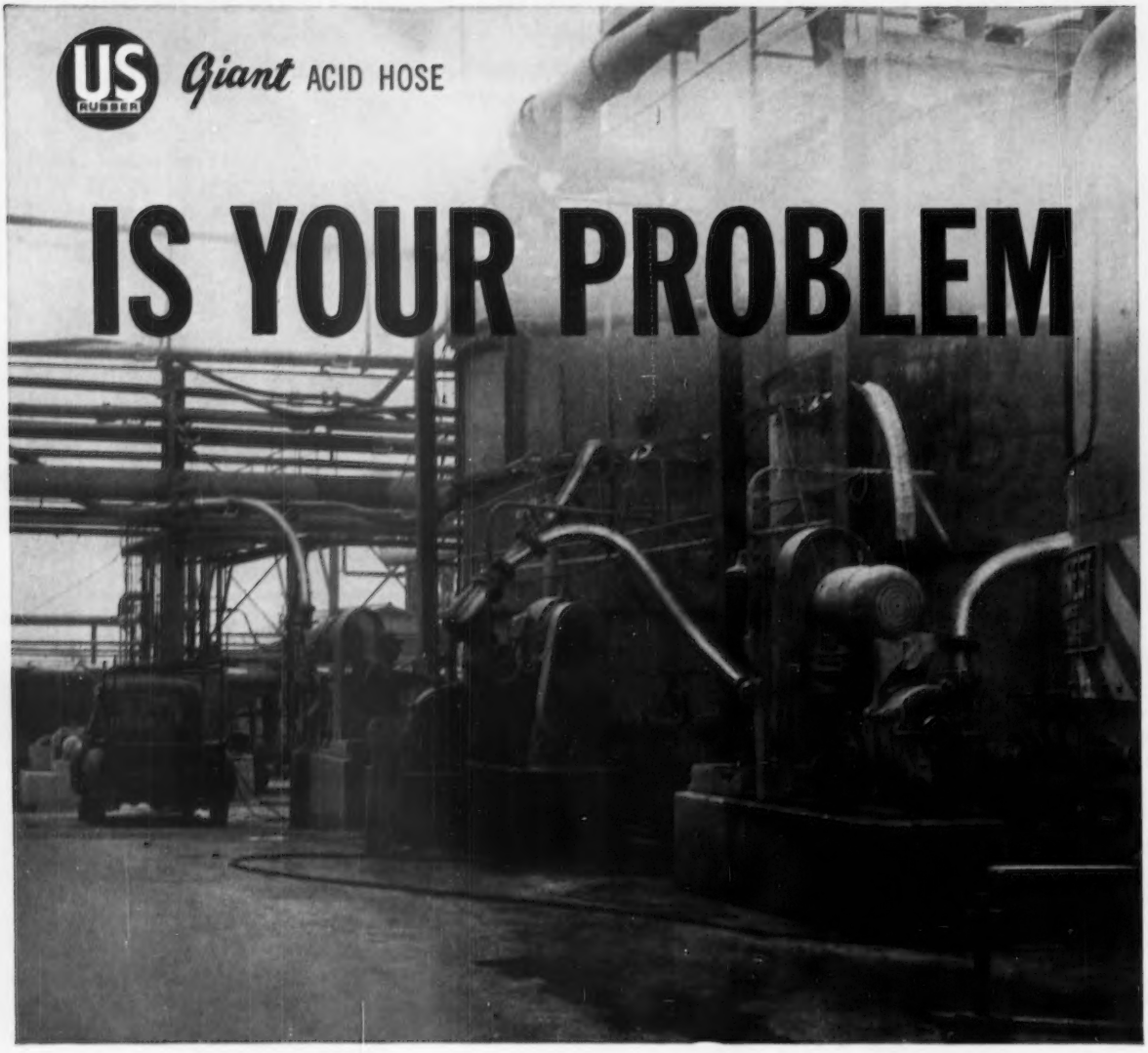
The Coaldale Mining Co., Coaldale, Pa., operates one of the region's best anthracite mines. The photograph above shows the headframe of No. 7 Shaft, with its four big bicycle sheaves and its sturdy steel ropes. Up the production compartments come heavy loads of coal, which are taken by rail to the rotary dump, then hauled up a plane to the breaker. No. 7 Shaft, now approximately 1100 ft deep, will handle some 3400 tons of coal and rock in an average day.

The capacity of the shaft cars is 4.9 tons. Lifting these loads is a job entrusted to Bethlehem wire rope, which is always specified in the Purple Strand grade. To insure the necessary combination of strength and fatigue-resistance, the ropes are supplied in the 1⅛-in. size with the popular 6 x 25 Type W construction.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

*Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:*

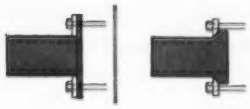
MINING • QUARRYING • CONSTRUCTION • EXCAVATING • PETROLEUM • LOGGING • MANUFACTURING




## Some of the fluids handled by U. S. *Giant* Acid Hose

**acetic acid**
**aluminum:** chloride, sulphate
**alums**
**ammonia**
**ammonium:** chloride, hydroxide, nitrate, phosphate (mono-, bi-, tri-basic), sulphate
**amyl alcohol**
**analine hydrochloride**
**arsenic acid**
**barium:** chloride, hydroxide, sulphide
**boric acid**
**butyl alcohol**
**calcium:** chloride, hydroxide, hypochlorite
**casein**
**chlorine dry** (wet on application)
**citric acid**
**copper:** chloride, sulphate
**dilute chromic acid**
**dilute nitric acid**
**ethyl chloride**
**ethylene glycol**
**ferric:** acid, chloride sulphate
**fluoboric acid**
**fluosilicic acid**
**formalin**
**formic acid**
**gallic acid**
**gelatine**
**glucose**
**glue**
**glycerine**
**glycerol**
**hydrobromic acid**
**hydrofluoric acid**
**hydrofluosilicic acid**
**hydrogen sulphide water**
**lime slurry**
**liquors:** beet sugar, caliche, cane sugar, green sulphate
**magnesium:** chloride, hydroxide, sulphate
**malic acid**
**methyl alcohol**
**mulic acid**
**nickel:** chloride, sulphate
**phosphoric acid**
**picric acid** (aqueous solution)
**plating solutions**
**potassium:** chloride, cyanide, hydroxide, sulphate
**propyl alcohol**
**soaps**
**sodium:** bicarbonate, bisulphate, carbonate, chloride, cyanide, fluosulphate, hydroxide, metaphosphate, phosphate (mono-, bi-, tri-basic), silicate, sulphate, sulphide
**stannic chloride**
**sulphur trioxide** (dry)
**sulphuric acid**
**sulphurous acid**
**tannic acid**
**tartaric acid**
**triethanolamine**
**vinegar**
**water, acid mine:** containing oxidizing salts, no oxidizing salts
**zinc:** chloride, sulphate

### INTEGRAL FLANGES



Either standard full-faced or unique, tapered Uscolok® flanges can be furnished on one or both ends of U. S. Giant Acid Hose. Both types of flanges are reinforced internally. They form a natural gasket or positive seal when bolted to companion flange.

# CORROSION?

## ...then check these advantages of U. S. *Giant* GIANT ACID HOSE over other types of corrosive fluid lines

| Type of Line | Corrosion Resistance | Unrestricted Flow | Ease of Installation | Economy | Continuous Alignment |
|---|---|---|---|---|---|
| U. S. RUBBER *Giant* ® ACID HOSE | ✓ | ✓ | ✓ | ✓ | ✓ |
| METAL ALLOY PIPE | | | | | |
| COPPER PIPE | | | | | |
| LEAD PIPE | | | | | |

**corrosion resistance** — specially compounded rubber tube gives outstanding service life, carrying a wide range of chemical solutions (see list on opposite page).

**unrestricted flow** — hose gently bends and curves, requiring no flow-restricting fittings as with rigid pipe.

**ease of installation** — because of the flexibility of the hose, it bends readily around obstructions; hose sections are connected with ease.

**economy** — U. S. Giant Acid Hose, because of its easy maneuverability, can be led more directly. This saves time, space and length of line.

**continuous alignment** — the flexibility of the hose automatically compensates for misalignment and movement. Especially valuable on temporary pump lines.

U. S. Giant Acid Hose—both for discharge and for suction and discharge—are specially constructed to conduct highly corrosive solutions. Both types of hose excel in meeting the severe conditions that are encountered in chemical plants, food plants, metal refineries, smelter operation, and other such places using highly concentrated chemicals.

These perfectly balanced hose are always engineered to the specific type of solution they will convey. They have a specially compounded rubber tube to resist the chemical being handled, a plied cotton duck carcass to combine strength with flexibility, and a really tough rubber cover that withstands abrasion, oxidation, temperature and weather extremes—as well as chemicals with which it may come in contact.

For new or replacement chemical lines, check the advantages of U. S. Giant Acid Hose over any other type line. This hose—with expert engineering assistance—is available at the 28 "U. S." District Sales Offices, at selected distributors, or write us at Rockefeller Center, N. Y. 20, N. Y.

In Canada, Dominion Rubber Co., Ltd.

Mechanical Goods Division

**United States Rubber**

See things you never saw before. Visit U. S. Rubber's new Exhibit Hall, Rockefeller Center, N. Y.

# WASHINGTON IMPACT

## Highlights

**LEAD-ZINC TARIFF DEAD**—Tariff relief for domestic producers of lead and zinc got bogged down in a complex procedural wrestling match during the closing days of Congress, with the result that the whole question now goes over until next Congressional session, when a wholesale review of trade policy is scheduled, and a general import quota bill is a sure bet to be brought up. (See story this page.)

**DIAMOND MAGNESIUM GOING, GOING**—Unhappy with the sale bids it has received on its Diamond Magnesium plant at Painesville, Pa., General Services Administration is auctioning it off. The plant has an annual capacity of 36-million lb, was built at a cost of over $15-million to the Government during World War II. Mothballed before and after the Korean fighting, Diamond was offered for sale last spring. Kaiser Aluminum and Wheeler Magnesium companies placed bids running between $2- and $3-million, which GSA rejected because of the conditions the bidders placed on the sale. So GSA has put Diamond on the block with the Samuel Winternitz auctioneers of Chicago, with the bids scheduled to be opened Sept. 12.

**FREIGHT RATES UP**—Transportation for everything but phosphate rock and potash will cost about a dime to 15c more per dollar. Interstate Commission has granted the railroads' request for higher freight rates—14% for the eastern roads, 12% for the western, and 9% for the southern. ICC also left the door open for further increases based on rising costs. And the trucks and waterway shippers are expected to follow suit without delay. Talk still centers around a total boost of up to 22% before the latest round of hikes is over. Phosphate rock and potash will be subject to increase hold-downs of 40c and 75c per net ton respectively.

**BARTER CUTS DEFENDED**—Once again, Agriculture Department's barter and stockpiling division officials were called to Capitol Hill to explain the new restrictions on surplus-crops-for-minerals barter deals. Following up hearings by the Senate Agriculture Committee, its counterpart committee in the House held its own inquiry. Secretary Ezra Benson is still sticking by the new regulations, which have already cut back barter negotiation substantially. Congress broadened White House authority to barter with satellite countries in a separate action, but these officials are doubtful these countries have much to offer in trade. The Senate and House hearings reflect Congressional pressure on Benson to step in and ease the new restrictions. Aluminum, incidentally, has been removed from the barter list by ODM.

**NEW LIFE FOR SBA**—The Small Business Administration got a new lease on life, though only a temporary one. Instead of passing the White House bill to make the agency permanent, Congress okayed it for another year, boosting its loan fund by $75-million, to $220-million. The agency is asking for another $25-million appropriations for next year, expects to see its permanent charter okayed next Congressional session.

**TAX WRITEOFFS KILLED**—Office of Defense Mobilization's dwindling program for granting fast tax amortization on production facilities was dealt a final and official death-blow when Congress passed a bill by Sen. Harry Byrd (D-Va.) ending the whole program by 1960. Meantime, the Byrd bill limits such tax help strictly to production and research and development being done under contract to the Pentagon or the Atomic Energy Commission. ODM has been holding writeoffs pretty much to defense facilities for some time, but the Byrd bill writes the policy into law.

**PHOSPHATE ACREAGE UPPED**—Congress finally okayed the long-delayed bill to boost to 10,240 acres the limit on public domain land that may be leased to any one company in any one state for development of phosphate. The same limit still applies to total holdings in the U. S. The previous state limit was half that acreage. The measure is aimed at speeding development of large deposits in Idaho, Montana, and Utah.

## Lead-Zinc Tariffs Die Despite Backers' Efforts

THE RECORD of efforts to hammer out a new, higher lead-zinc tariff for the protection of small domestic mines is a study in complicated political maneuvering. Proponents of such a tariff came close to winning a surprise upset. The real reason they lost is because of the opposition of low-tariff proponents in the House and White House. Here's what happened—

After extensive hearings before both House and Senate committees, an awkward situation became apparent—only the Administration supported the sliding-scale import tax proposal, and that somewhat reluctantly. Large producers with overseas mines teamed up with processors, refiners, smelters and international traders in opposing new tariff boosts. Small domestic mines damned the sliding-scale bill with faint praise, claiming it totally inadequate to give them the protection they feel they need. Therefore little pressure for passage developed.

This situation gave low-tariff Democrats in the House Ways & Means Committee, led by chairman Jere Cooper (Tenn.), and Reps. Wilbur Mills (Ark.), and Hale Boggs (La.), a chance to "sit" on the bill, and refuse to report it out. The scene then shifted to the Senate, where small domestic producers have a stronger proportional voice than in the House.

The Senate Finance Committee, prodded by mining-state spokesmen Clinton Anderson (D-N.M.), and Frank Carlson (R-Kans.), voted to amend a minor House-passed bill dealing with tariffs on certain grades of mica (H.R. 6894), by tacking on a straight 3¢ per lb boosted duty on pig lead and slab zinc. This was less than the 6¢ domestic producers had asked originally, but was considered a workable compromise.

As soon as Senate Finance did this, Rep. Cooper and 14 House Ways & Means Committee Democrats announced their opposition to any new lead-zinc tariff law, suggested instead that the Administration seek relief from the tariff commission under existing law, or from Office of Defense Mobilization under the so-called defense essentiality clause. This move had been suggested during House hearings, and was turned down by Administration spokesmen on the grounds that the sliding-scale plan would give more relief faster than the Tariff Commission, and that no mobilization emergency existed which could justify going to ODM.

House opponents, and some Senators, argued that passing a new law for lead and zinc would "open the floodgates" for other similar requests from other industries.

Faced with the Senate committee action, Interior Department was asked to support a compromise version of the flat 3¢ proposal. At first, Interior was inclined to go along, but then under pres-

sure from State Department and the White House, backed down and insisted on its original sliding-scale plan. The Senate Finance group briefly considered going it alone and fighting for the 3¢ bill, but it, too, backed down in the face of a White House veto.

This left the sliding-scale plan pending before the Senate and bottled in the House committee as this issue of *E&MJ* went to press. Because the Senate bill was an amendment to a House-passed bill, it could have by-passed the House committee. But even then it faced sure death in the House, where the full membership is prevented by parliamentary rules from agreeing to the Senate amendment unless such a motion is recognized by the Speaker. Cooper and his colleagues were assured by Speaker Sam Rayburn (D-Tex.) that it would not be made.

The final result, then, is that despite considerable Congressional sympathy for the plight of domestic lead and zinc mines, the whole question goes over until the next session of Congress. A full-scale review of trade policy in general is scheduled for next year, and lead and zinc are sure to be considered in an over-all import quota bill now being planned by protectionist forces in Congress.

## Late Developments

MINE SAFETY HEARINGS got another airing before a House Labor Subcommittee before Congress adjourned. Mine, Mill, and Smelter Workers Union witnesses supported measures to set up Federal safety inspection, citing figures to show that metal mining accidents now run four times the rate for all U. S. industries. American Mining Congress officials recommended that inspection be left to state governments, now charged with safety matters, and introduced statistics to show a declining rate of accidents. No further action will be taken on several bills before next session.

OFFICE OF DEFENSE MOBILIZATION has put out its latest "shopping list" of materials which GSA is authorized to acquire for stockpile and through barter. The list follows:

For the strategic stockpile: amosite asbestos, electrolytic and metallurgical fluorspar, jewel bearings, lead, battery-grade synthetic dioxide manganese and type-B chemical-grade manganese, muscovite block and film mica, selenium and zinc.

Strategic stockpile through barter: amosite asbestos, muscovite block and film mica, and crude silicon carbide.

Supplemental stockpile through barter: antimony, Jamaica and Surinam and refractory-grade bauxite, copper, metallurgical-grade fluorspar, battery-grade synthetic dioxide manganese and type-A chemical-grade manganese ore, muscovite and phlogopite splittings mica, paladium, selenium, and zinc.

# Labor This Month

**CONGRESS SHUNS LABOR LEGISLATION:** In an unusual display of disinterest, Congress went through the first session of the 85th Congress without a single major piece of labor legislation to show for its efforts. Starting the term with a score of important measures, both the Senate and House wound up with a scorecard of zero. Extension of the minimum wage, curbs on welfare funds, proposed Taft-Hartley changes—these all went by the boards for another term.

Next year will be a different matter. The Senate Investigating Committee will have a full record on labor racketeering—and the pressures will be on to tie new legal restrictions around unions. Before it's over, the labor organizations might well be willing to settle for the same outcome as this year; nothing at all. Because it looks like any new measures aren't going to be to the likings of union leaders. Laws will be tightened on labor, not eased. That's the penalty of the racketeering revelations. Labor's own clean-up drive, through the AFL-CIO, is unlikely to be complete enough to satisfy Congress. Where the new laws will hit is still an open question. But there are drives for new anti-trust restrictions, curbs on political action and union security, rules for democratic procedures in unions and the like.

The political program of the International Mine-Mill and Smelter Workers fell by the wayside—along with those of other unions. Mine-Mill had an extensive campaign in Congress for a number of key measures. Its representatives testified on non-labor matters, too, with special emphasis in the dying days of Congress on the troubles of the non-ferrous industry. Vice president, Orville Larson, and secretary-treasurer, Albert Pezzati, were witnesses before both House and Senate committees, arguing for Federal aid to the industry. They claimed a 25% cut in lead-zinc mining employment during the past few months because of the production cutback. But, even this legislative appeal failed to stir immediate action in Congress.

**STATES TAKE UP LEGISLATIVE SLACK:** Where Congress sidestepped labor legislation this session, the state governments came up with a number of new laws. This is especially significant because of the Eisenhower Administration's emphasis on States' rights. It may be the start of a pattern where the states will do most of the work in the future—a trend that will force a shift in lobbying emphasis from the nation's capitol to the capitols of the 48 states.

The 1957 state scorecard shows action in 45 states, with these important results: new minimum wages were adopted by three more states—Nevada, Rhode Island and Connecticut—and Vermont became the 30th state with a wage floor. At the same time, unemployment benefits were increased in 22 states.

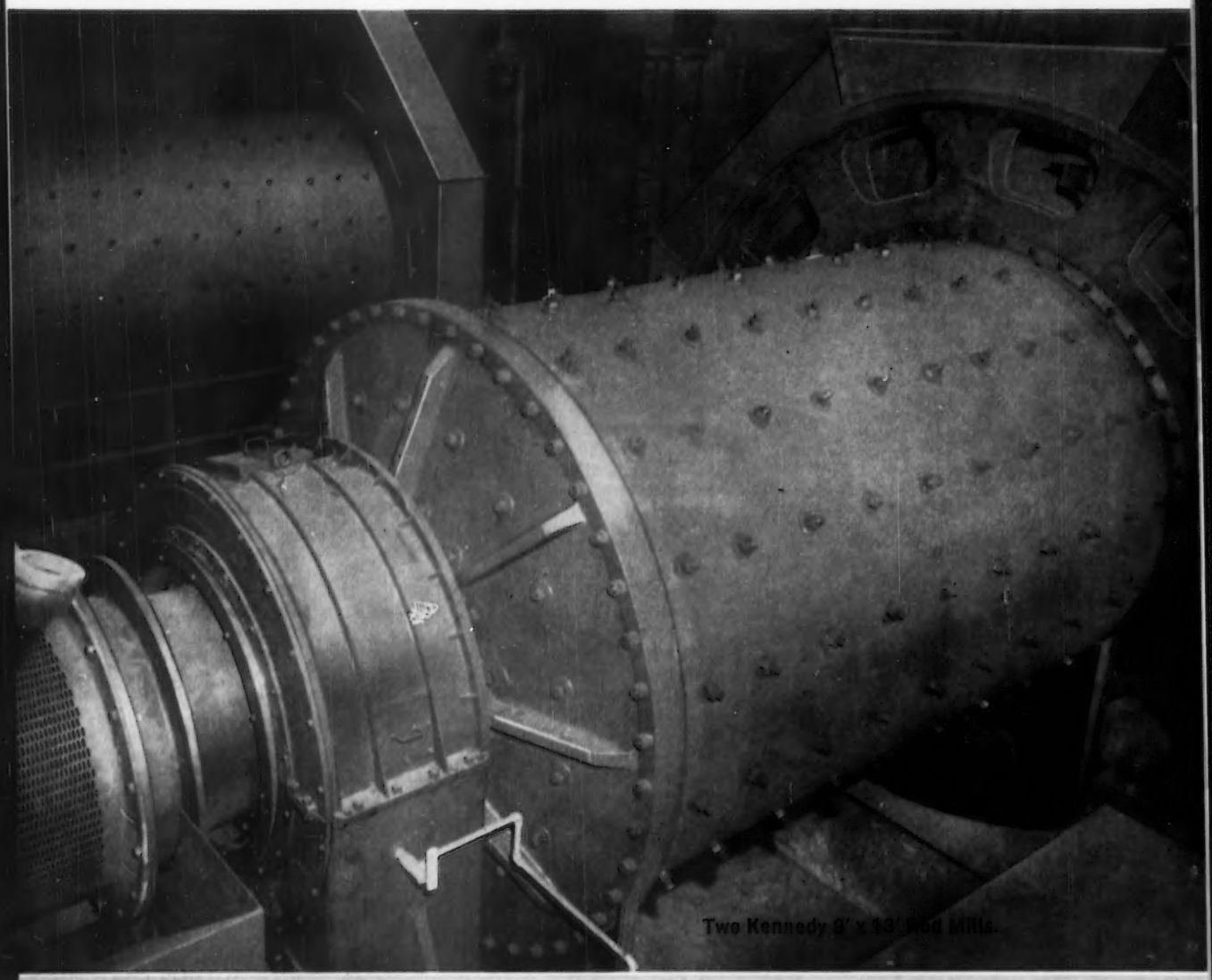
On welfare funds, where the Federal Congress failed to adopt new checkreins on use of such funds, three states added new restrictions on fund operations; New York tightened its already-existing law. On the hottest issue of all, however, there wasn't much done. One new right-to-work law was approved in Indiana. Despite intensive lobbying by labor to repeal laws banning union security agreements, none did so. With the action in Indiana, 19 states now have measures banning compulsory unionism. No further significant action in this field will come until 1959 when most of the state legislatures again meet.

**1957 BARGAINING—HIGH WAGES, FEW STRIKES:** With most important negotiations for this year completed, the bargaining picture has some good signs for both management and labor. As far as strikes go, there were fewer in 1957 than at any time since World War II. The biggest reason is that there were few big negotiations; most major contracts were tied up by long-term agreement.

Pay advances soared, mostly due to automatic adjustments in wages and cost-of-living advances. These annual boosts in the long-term pacts totaled between 14c and 16c this year—a hefty average of about 6%. Negotiated increases had a hard time keeping up, even with the upward pressures of the running contracts.

# KENNEDY ROD MILLS

*Now in Operation*



Two Kennedy 9' x 13' Rod Mills

## FEATURES THAT DISTINGUISH KVS GRINDING MILLS

★ Cast Steel or Meehanite Heads ★ Welded and Stress-relieved Shells

★ Large Diameter Trunnions ★ Self-aligning bearings with adjustable Sole Plates

★ Positive Ferris Wheel lubrication for main bearings with oil-tight seals

★ Motorized Hydraulic Lift to reduce starting torque

*Let our Engineering Department furnish data on any size mill for wet or dry grinding—*

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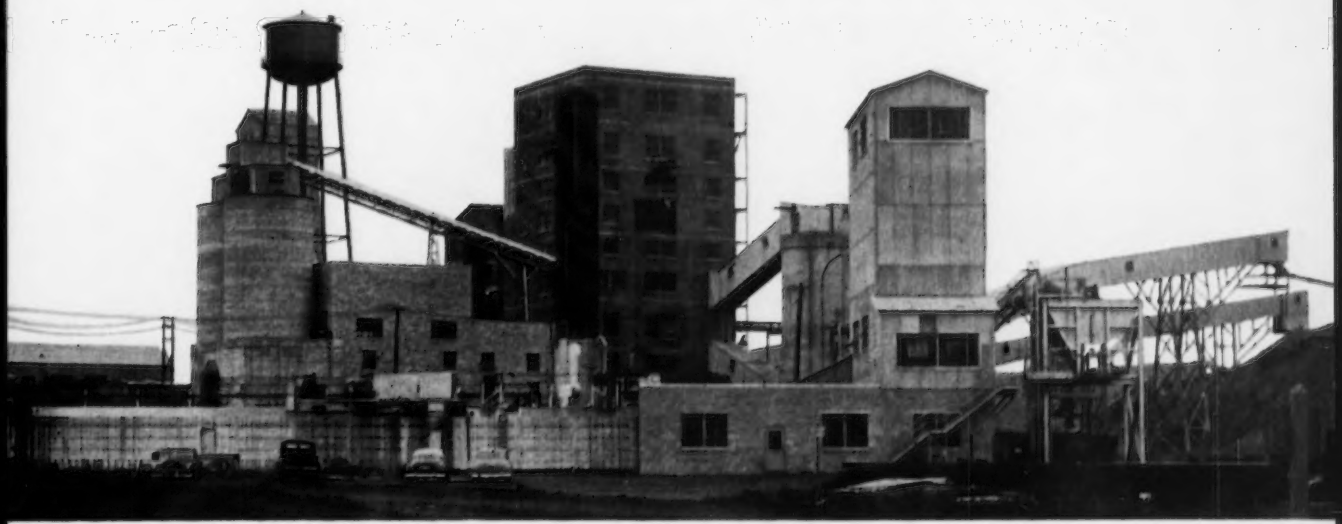
## *at SHAHMOON INDUSTRIES*

Shahmoon Industries use Kennedy Swing Jaw Crushers, Rod Mills, Rock Feeders and Conveyors to crush, grind and transport ore.

Kennedy equipment was chosen on a basis of proven performance, peak capacities and lowest maintenance and power costs. Our engineers are available for consultation on any problems relating to the handling and crushing of all types of rock and ore.



### KENNEDY PRODUCTS

- Gyratory Crushers
- Swing Jaw Crushers
- Tube Mills
- Ball & Rod Mills
- Vibrating Screens
- Rock Feeders
- Air Swept Tube Mills
- Rotary Kilns
- Coolers, Dryers
- Preheaters, Deheaters
- Belts, Conveyors
- Pneumatic Transport Systems
- Asbestos Plants
- Complete Lime Plants
- Complete Cement Plants
- Steam Generators
- Complete Aggregate Processing Plants
- Waste Heat Boilers
- Pulverized Coal Firing Systems

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# WHAT'S NEW IN U.S. PATENTS

**OLIVER S. NORTH**

## Ore Dressing

**Device for automatically raising or lowering the outer crushing member or concave of an ore crusher.** An overload release automatically stops the drive motor when tramp iron or other harmful foreign material becomes lodged in the crusher. A. W. Kjelgaard. No. 2,791,383.

**Method of simultaneously wet grinding and classifying a copper, lead or zinc sulfide ore to prepare it for flotation or other procedures for separation of values from gangue.** Ore is ground to the critical fineness to free values, and pulped in a ball mill. Pulp density is maintained relatively low, being not greater than that appropriate for conventional mechanical classification of the ore. Mill is rotated at a low speed so that the balls slide or roll into the pulp instead of cataracting or falling free. A stream of ground and classified pulp containing a low percentage of slime is discharged continuously. This method reduces the period of exposure of the ore to oxidation, eliminates necessity for a separate classifier unit, lessens production of undesirable ultrafine particles, and increases capacity and effectiveness of subsequent conventional concentrating equipment. J. F. Myers. No. 2,791,382.

## Hydrometallurgy

**Method of recovering molybdenum from sulphide ore concentrates.** Crushed ore is mixed with an alkali metal nitrate and an alkali metal carbonate and heated to reaction. Reaction product is leached, and the dissolved molybdate recovered. J. H. Brennan, assigned to Union Carbide & Carbon Corp., No. 2,796,344.

**An economical countercurrent decantation leaching method and apparatus for recovering potassium chloride from sylvanite.** System consists of five covered tanks arranged in line at successively higher elevations. Each of the tanks is provided with a heating coil. During operation, a hot NaCl-saturated solution is supplied to tank through pipe and crushed sylvanite ore is fed to the lowermost tank by belt conveyor through a chute. Blades mounted on double impellers agitate the solution in each tank. Liquid and solids are pumped to the bottom of higher tanks in the series, while a solution containing progressively higher proportions of KCl overflows into lower tanks. At the end of the circuit, a KCl-enriched solution flows from tank through a pipe. Solids, mainly NaCl, are removed from a tank by a rake and dewatered, the overflow being returned to the system. Efficient operation requires co-ordination of temperature, impeller velocity, rate of ore feed, volume of input through the pipe, and volume of withdrawals through second pipe and dewaterer. This process is continuous and requires a comparatively small crew of men. W. P. Wilson, assigned to U. S. Borax & Chemical Corp. No. 2,792,289.

## Pyrometallurgy

**Process for beneficiating nickel-iron lateritic ores.** The contained nickel is selectively chloridized in a chlorine-oxygen atmosphere and removed as a volatile compound which can be conventionally treated for recovery of nickel. The substantially nickel-free residue is suitable for smelting in a blast furnace. H. H. Vaughan, assigned to Jones & Laughlin Steel Corp. No. 2,797,155.

**Simple and inexpensive apparatus and method** for charging ceramic containers in production of sponge iron by the Hoeganaes Process. Improved uniform layering of materials is obtained without use of a binding agent. S. E. Sieurin and E. V. Olsson, assigned to Hoeganaes Sponge Iron Corp. No. 2,797,157.

**Process for efficient recovery of lead from lead sulphide ores, concentrates and the like.** The material is granulated with oxidic lead ore. Recycled material or lead fly ash is added, and the mixture roasted to reaction temperature to produce metallic lead and volatile sulphur compounds. H. Wendeborn, W. Schwartz, C. A. Maelzer and H. Rausch, assigned to Metallgesellschaft AG. No. 2,797,158.

**Purification of indium metal.** A molten pool of the metal is partly converted into a chloride slag, the lower metal values tending to concentrate in the unslagged portion of the pool. The slag is separated and added to water. Indium values in the slag precipitate are recovered. Y. E. Lebedeff and W. C. Klein, assigned to American Smelting & Refining Co. No. 2,797,159.

**An inexpensive process for producing free iron** suitable for admixture with flue dust, iron ore fines or the like, and for agglomerating such admixtures to obtain a material ideal, after induration, as a furnace feed. J. Huebler and D. Beggs, assigned to Surface Combustion Corp. Toledo, Ohio. No. 2,793,109.

**In an improved process for producing lithium salts from spodumene,** the crushed ore is converted to gamma spodumene by calcination with a flux such as lime at about 1,300 deg C, cooling and finely grinding the calcined mass, and extracting the lithium as a salt therefrom with an aqueous leaching, such as HCl or NaCl, at superatmospheric pressure and at a temperature of from about 100 deg C to 400 deg C. A. V. Kroll, (assigned to Compagnie Geologique et Miniere des Ingenieurs et Industriels Belges "Geomines" Societe Par Actions a Responsabilite Limitee, Manono, Belgian Congo). No. 2,793,933.

**Cyclic process for roasting spodumene** or lithium-bearing pegmatites and recovering high purity lithium carbonate from the gas evolved, with production of portland cement clinker as a byproduct of the roasting step. G. L. Cunningham. assigned to Chempatents, Inc., New York. No. 2,793,934.

**Process for recovering zinc values from metallurgical slags.** Combustible mixture of oxygen and oil is injected into the molten pool at such rate as to maintain the molten bath. Zinc values are reduced to metallic zinc, volatilized and recovered. D. H. McIntosh, assigned to American Smelting & Refining Co. No. 2,795,500.

**COPIES OF U. S. PATENTS can be purchased at 25¢ each from Commissioner of Patents, Washington 25, D. C.**

**Method for roasting pyrite or pyrrhotite concentrates.** Air is introduced into a vertical column of previously roasted ore to fluidize the material, and the additional amounts of ground ore are charged to the fluidized column. H. M. Cyr, C. W. Siller and T. F. Steele, assigned to New Jersey Zinc Co. No. 2,796,340.

**In a method for reducing iron ores,** especially titaniferous ores, a part or all of the usual limestone fluxing material is replaced with an alkali metal halide, such as ordinary salt, thereby producing a lower melting slag. R. A. Halversen. No. 2,792,299.

Mr. North is patent consultant, Washington, D.C.

# NEW BOOKS

**Milling Plants in Canada, Part II, Industrial Minerals.** Published by Department of Mines and Technical Surveys, Ottawa, Ontario, Canada. Lists mines by commodities in 34 pp. Price 25c.

**Metal Resources Circular No. 2, Copper, Nickel, Lead and Zinc Deposits of Ontario,** by James E. Thompson and others. Published by Department of Mines, Ontario. Map and 120 pp.

**Handbook of Powered Industrial Trucks** will be published this fall by Industrial Truck Association. Manual will cover all types of powered industrial equipment in 94 pp. Industrial Truck Association, 9th and F Sts., Washington 4, D. C. 94 pp. Price $5.

**Accidents Facts.** Accident statistics for 1957 compiled by National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill. Price $1.15.

# Ore processing called for stout "muscles"

Iron-shod stamps relieved men of the back-breaking task of crushing ore with a hammer. But these primitive replacements for muscle power required long and tedious workmanship, were clumsy and difficult to operate and still produced only small quantities.

Today's ore processing plants use the muscle power of efficient grinding mills to turn out many tons of processed ore per day. Many mill users specify and insist upon CF&I Grinding Balls and Rods for their mills because the steel has the ideal toughness-hardness balance that assures optimum grinding ability plus maximum wearability.

5098

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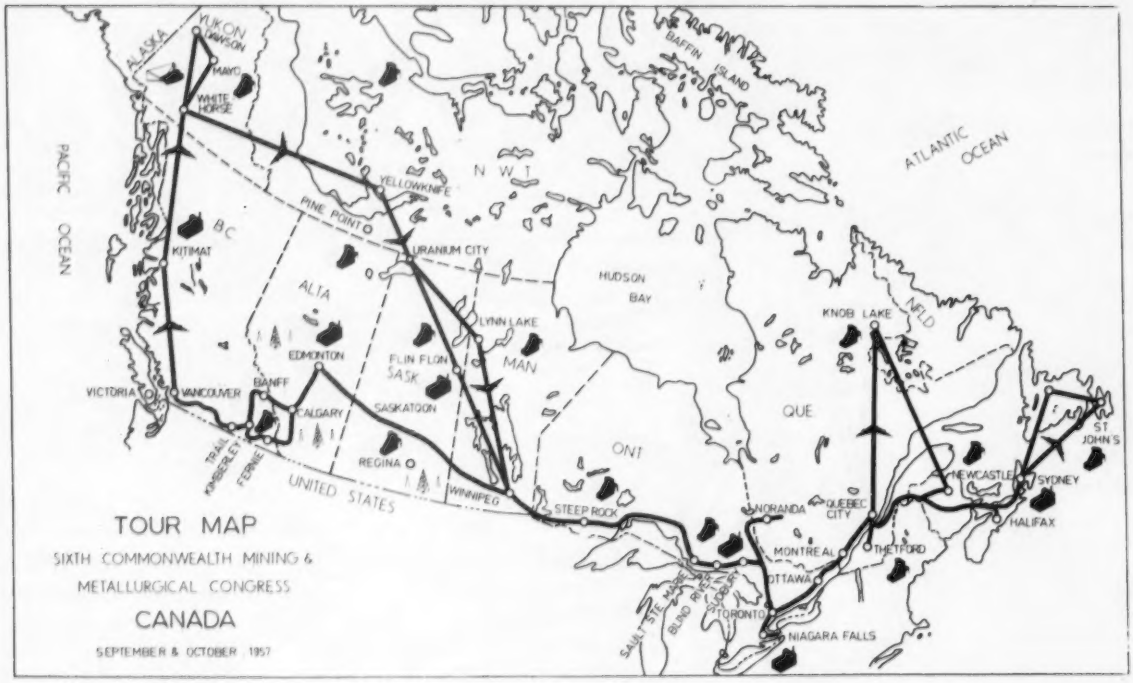
CF&I



Euclid




# Canada Spreads Welcome Mat for Mine Group Tour

MORE THAN 450 DELEGATES from 31 countries are participating in the Sixth Commonwealth Mining and Metallurgical Congress, a 32-day tour and technical program of Canada's mineral resources.

Delegates were to arrive at Vancouver, B.C. Sept. 8 to start the program and wind up at Halifax, N.S. Oct. 9. Highlights of the trip, as planned for mining and mineral processing men, include the following:

Mines and smelter at Trail; Sullivan Pb-Zn mine at Kimberley and fertilizer operations; geological trip to Banff-Lake Louise; Sherritt Gordon's metal processing plant near Edmonton; potash near Saskatoon; airborne research exhibit and Inco exhibit at Winnipeg; air trip to Alcan's Kitimat; United Keno Hill Mines Pb-Zn out of Whitehorse; Giant Yellowknife Gold and Cominco's Con mine at Yellowknife; uranium at Eldorado Mining and Refining and Gunnar; Ni-Cu at Sherritt Gordon's Lynn Lake; lead-zinc-copper at Hudson Bay Smelting & Refining at Flin Flon; iron ore at Caland and Steep Rock; iron and steel at Algoma-Sault Ste. Marie; uranium at Blind River; nickel-copper at Inco and Falconbridge;

Also, gold mines at the Timmins Porcupine sector; asbestos at Canadian Johns-Manville; gold mines at Kirkland Lake; copper-gold at Noranda; government research at Ottawa; St. Lawrence Seaway; asbestos at Thetford; iron mines at IOCO's Knob Lake; base metals at Bathurst and at Heath Steele; base metals at Buchans, Nfld.; industry at Halifax.

The hardy volunteers for the Sixth Commonwealth tour will be representing some 28,000 members of the Australasian Institute of Mining and Metallurgy, Canadian Institute of Mining and Metallurgy, Institute of Metals (London), Institute of Mining Engineers (London), Institute of Mining and Metallurgy (London), Institute of Petroleum (London), Iron and Steel Institute (London), Mining, Geological and Metallurgical Institute of India, South African Institute of Mining and Metallurgy, and the South Wales Institute of Engineers.

The delegation will also include representatives of interested government agencies, and technical societies and institutions not affiliated with the commonwealth Council of Mining and Metallurgical Institutions. Formal meetings of the congress will be convened at the larger cities along the tour, and opportunities have been created for scenic side trips. A comprehensive program for the visiting ladies has also been set up by the arrangement committees.

Among the officers of the congress are, R. W. Diamond, Trail, president; Robert A. Bryce, president, Macassa Mines, Ltd., Toronto, general chairman; H. L. Roscoe, vice president, Noranda Mines, Ltd., Toronto, and H. R. Banks, consulting metallurgist of Ottawa, co-chairmen; and C. H. Mitchell, Vancouver, executive secretary.

# Additions for Your 1957 Buying Directory

PLEASE MAKE the following additions to the product listings and manufacturers' index in your 1957 issue of the *E&MJ Guidebook and Buying Directory*, published in mid-June.

Under Hardfacing, Alloys & Rods: Stoody Co., P.O. Box 901, Whittier, Calif.

Drill (Rock) Bits, Percussion: Timken Roller Bearing Co., 1835 Dueber Ave., S.W., Canton 6, O.

Contractors, Aerial Exploration, Mapping, Etc.: Hunting Technical and Exploration Services Ltd., 1450 O'Connor Dr., Toronto 16, Can.; Aeromagnetic Surveys Limited, same; Photographic Survey Corp., Ltd., same; and Hunting Geophysics Ltd., 6 Elstree Way, Boreham Wood, Herts, Eng.

Rock (and Roof) Bolt Accessories: American Mine Supply Co., 405 Frick Bldg., Pittsburgh 19, Pa.

Refractories, Brick; Castable; Refractory Cement; Refractory Material: Gladding, McBean & Co., 2901 Los Feliz Blvd., Los Angeles 39, Calif.

Portable Rock Drills: Warsop Power Tools, Ltd., 42 Northline Rd., Toronto 16, Ont., Can.

# Euclid

Tremendous power, speed and maneuverability make the 436 h.p. Euclid TC-12 Twin-Power Crawler a top performer in heavy duty mine and quarry work. No other tractor matches it for low cost production in stripping overburden, clearing, stockpiling, building haul roads and other big tractor jobs.

Euclid scrapers have struck capacities from 7 to 24 cu. yds. with engines ranging from 143 to 518 h.p. The complete line, including both two axle and three axle models, has hydraulic lever action that eliminates down-time caused by cable breakage. Good maneuverability and fast travel speed reduce cycle time . . . help move more loads and more yards for lower cost stripping operations.

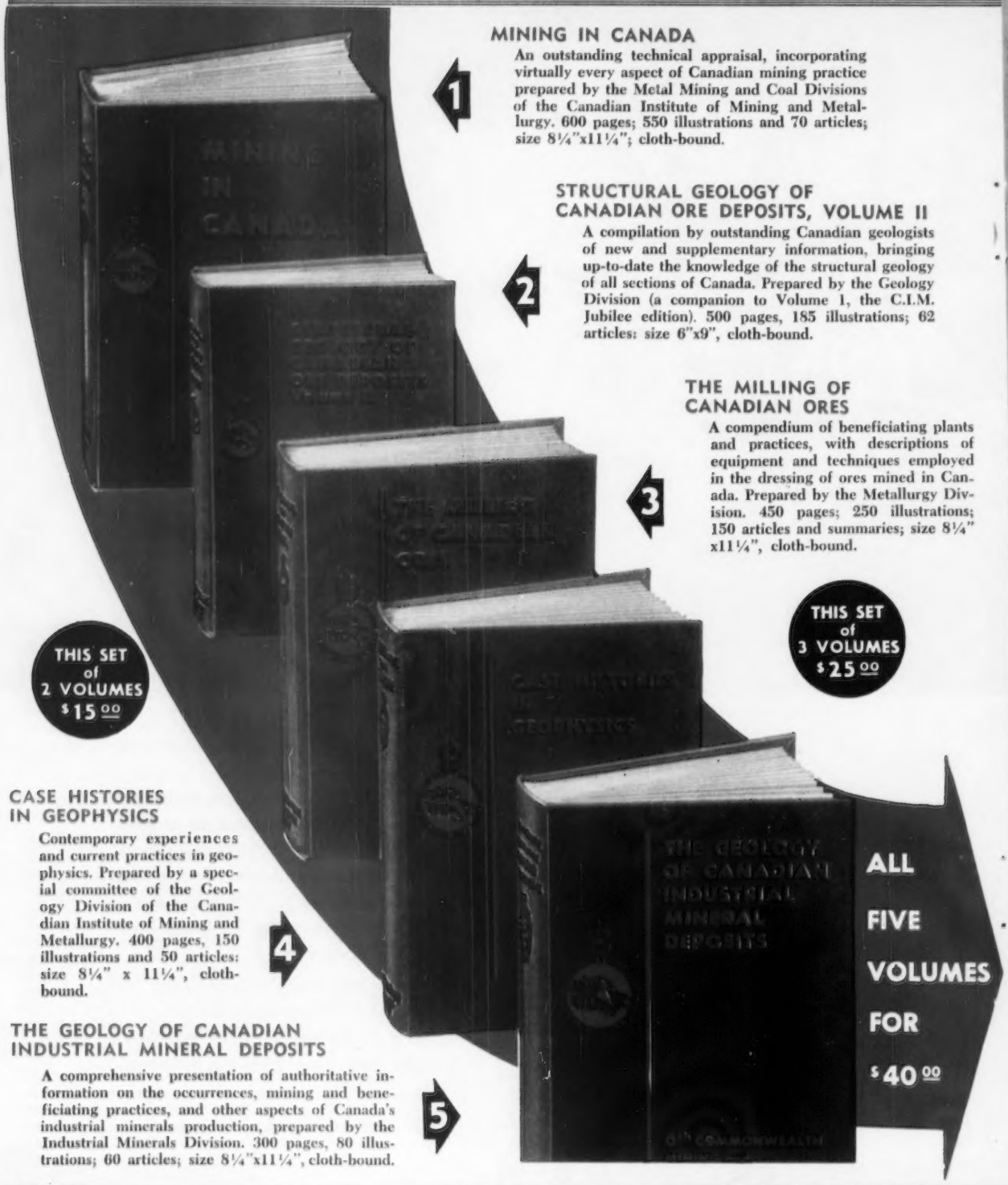
Check the many advantages of "Eucs" for your operation . . . have a Euclid dealer show you why ***Euclids are your best investment.***

EUCLID DIVISION, GENERAL MOTORS CORP., Cleveland 17, Ohio

# Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

# An Encyclopedia of



**1 MINING IN CANADA**

An outstanding technical appraisal, incorporating virtually every aspect of Canadian mining practice prepared by the Metal Mining and Coal Divisions of the Canadian Institute of Mining and Metallurgy. 600 pages; 550 illustrations and 70 articles; size 8¼"x11¼"; cloth-bound.

**2 STRUCTURAL GEOLOGY OF CANADIAN ORE DEPOSITS, VOLUME II**

A compilation by outstanding Canadian geologists of new and supplementary information, bringing up-to-date the knowledge of the structural geology of all sections of Canada. Prepared by the Geology Division (a companion to Volume 1, the C.I.M. Jubilee edition). 500 pages, 185 illustrations; 62 articles: size 6"x9", cloth-bound.

**3 THE MILLING OF CANADIAN ORES**

A compendium of beneficiating plants and practices, with descriptions of equipment and techniques employed in the dressing of ores mined in Canada. Prepared by the Metallurgy Division. 450 pages; 250 illustrations; 150 articles and summaries; size 8¼" x11¼", cloth-bound.

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**4 CASE HISTORIES IN GEOPHYSICS**

Contemporary experiences and current practices in geophysics. Prepared by a special committee of the Geology Division of the Canadian Institute of Mining and Metallurgy. 400 pages, 150 illustrations and 50 articles: size 8¼" x 11¼", cloth-bound.

**5 THE GEOLOGY OF CANADIAN INDUSTRIAL MINERAL DEPOSITS**

A comprehensive presentation of authoritative information on the occurrences, mining and beneficiating practices, and other aspects of Canada's industrial minerals production, prepared by the Industrial Minerals Division. 300 pages, 80 illustrations; 60 articles; size 8¼"x11¼", cloth-bound.

ALL FIVE VOLUMES FOR $40.00

# Canadian Mining

## Mining . . . Geology . . . Metallurgy . . . Geophysics . . . Industrial Minerals

This comprehensive record of current practices and procedures in the Canadian Mineral Industries is published on the authority of the Sixth Commonwealth Mining and Metallurgical Congress. The five volumes, attractively presented and profusely illustrated, are a most valuable addition to the personal and technical libraries of mining men everywhere.

These invaluable works of reference and general information, written by outstanding professional and technical personnel recognized as leaders in their respective fields . . . compiled and prepared by the Technical Divisions of the Canadian Institute of Mining and Metallurgy . . . will prove to be an indispensable source of guidance and information on the search for, and the development, extraction and beneficiation of Canada's mineral resources.

These five authoritative volumes are certain to be recognized as major contributions to modern mining and engineering literature, and will quickly attain wide-spread use . . . as technical references and text books . . . by mining companies, consultants, universities, government departments and many other organizations and individuals. The Sixth Congress and the Technical Divisions of the Institute are proud to present this Encyclopedia of Canadian Mining.

Now is the time to reserve your complete set . . . or selected volumes . . . at special prices. These five books represent an investment in the most up-to-date treatises on the the Canadian mineral industries ever published. Only a limited number of each volume will be printed. To ensure receipt of your copies, complete and return the coupon below without delay.

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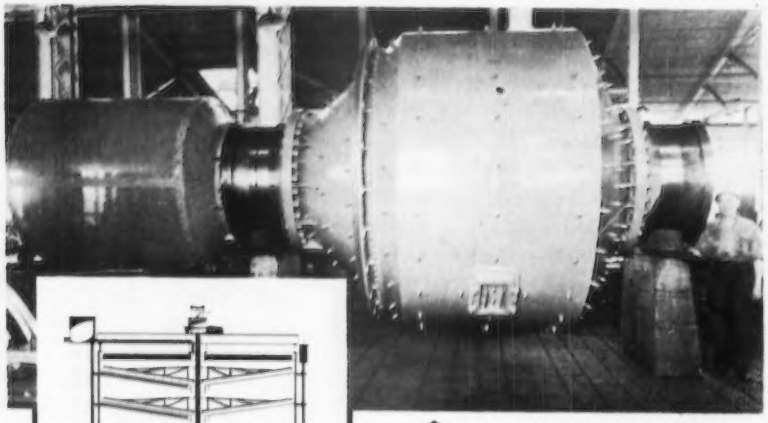
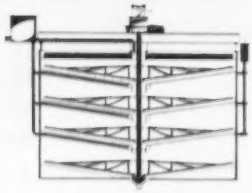
# Hardinge
## In The Caribbean

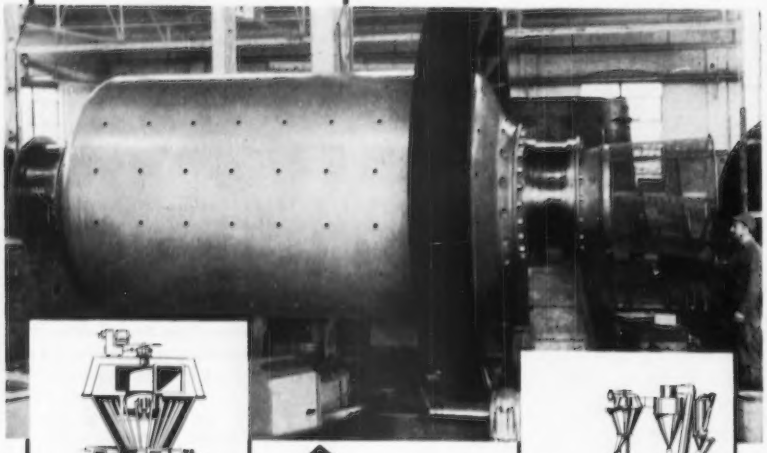
. . . and wherever the ores of the earth are being processed, Hardinge equipment is in service.

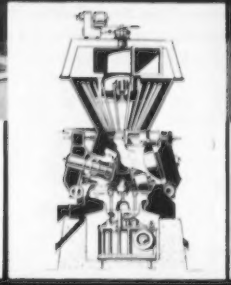


WET-GRINDING BALL MILLS



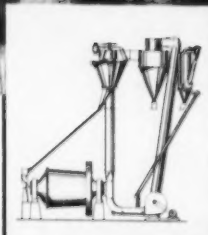
THICKENERS AND AGITATORS





Wet-Grinding Rod Mills

Dry-Grinding Disc-Roll and Ball Mills with Air Classifiers



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## GE Salvages Uranium From Hanford Sludge

LARGE ARTIFICIAL URANIUM deposit is being salvaged by the General Electric Co. at Atomic Energy Commission's Hanford, Wash. plant.

During mid and late '40s, uranium and other radioactive materials were mixed and stored in underground tanks. Now a sludge deposit of varying viscosity, the uranium compound is first broken up by pressured water streams and then pumped to surface.

According to J. J. Courtney, Hanford's metal recovery manager, a large percentage of "tank farm" uranium has been salvaged.

## San Francisco Chemical Opens Phosphate Plant

WITH THE OPENING of the "C" plant at its Leefe, Wyo. phosphate rock property, San Francisco Chemical Co. is nearing the final stages of its $2.3-million project to supply high-quality fertilizer to the Western states. Final stage, a conversion plant employing the latest developments in FluoSolids multiple-hearth calcination, is under way. "C" and conversion plant are rated at 1,000 tpd.

With the new facilities, San Francisco Chemical will mine high-, medium- and low-grade ore and offer a more uniform product to industry. Open pit methods will be employed at Leefe and in Idaho and underground in Utah. All mines will supply the Leefe plant.

Hydrometallurgical research at the Colorado School of Mines Research Foundation on the project was complemented by pyrometallurgical work at the company's Waterloo mill, at Montpelier, Idaho.

## Condoroma Starts Ore Processing in Peru

OFFICIAL INAUGURATION took place June 16 of the new concentrator of the Condoroma mine of Mauricio Hochschild & Cia. Ltda., located at an elevation of over 16,000 ft in the Province of Espinar, Department of Cuzco, near the summit of the Western Cordillera of the Andes. This is the second highest concentrator in Peru, the highest being at the Sucuitambo mine, also belonging to Hochschild.

The Condoroma mine had been worked in Colonial times and was mentioned by Eduardo de Rivera y Urtaviz, Director General of Mines in 1826 in his report for that year.

In October 1952, the property was optioned by Mauricio Hochschild & Cia. Ltda., S. A., and a provisional access road was constructed to the mine. $500,000 was eventually spent in exploration of the orebody.

The option was exercised at a price




**HOW TO GO UNDER WATER AND GET ALL**


Condoroma (Continued)

of $300,000 and in June 1955 the Cia. Minera Condoroma, S. A. was formed with an initial capital of $700,000.

Exploration was continued and to date 200,000 tons of ore have been proven in the Condoroma mine and a further 100,000 tons in the neighboring Kata mine, the assays averaging 4 to 5% lead, 4 to 5% zinc and 20 to 25 oz of silver per ton.

In January 1956 orders were placed for a 100-ton concentrator. The greater part of the machinery was manufactured and installed by Maestranza General, S. A., Lima, with exception of the electrical installations and equipment requiring heavy castings (jaw crusher, gyratory crusher and ball mill, all bought from the Straub Manufacturing Co.) and specialized equipment such as the vacuum filter or Wemco scavenger flotation cells. The prefabricated structures for the buildings were manufactured and erected by another Lima company, Promotora Comercial, S. A. In April 1956 it was decided to double the capacity of the concentrator, increasing it to 200 tpd.

The concentrator is one of the most modern in Peru. The first 100-ton unit entered into production Nov. 15, 1956, or in the record time of 11 months after placing the first orders. The second unit entered into production on May 15, 1957.

Until hydroelectric power can be provided, current is being supplied by two supercharged Siemens-Deutz generators, type BV6M 545, 6-cylinder, 500 hp 360 rpm, which have proven to be especially reliable and efficient under heavy working conditions at high altitudes. All drilling and mining equipment was supplied by Chicago Pneumatic Tool Co.

Concentrator production is 370 tons of lead concentrate of 55% Pb and 290 oz silver per month and 250 tons of zinc concentrate of 60% Zn and 30 oz. of silver. Total silver production is thus in excess of 100,000 oz per month, making the mine one of the most important silver producers in Peru.

The mine has ample living quarters for employees and workmen, its own school and cinema and a hospital having the most modern X-ray and other equipment. The highway connecting the mine with the Imata railway station represents an investment of $100,000. From Imata the concentrates are shipped by rail to the port of Matarani.

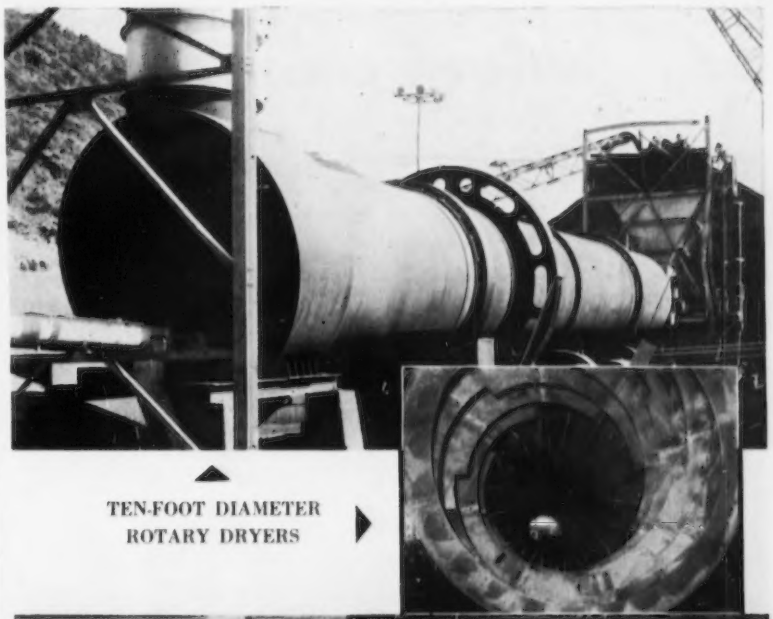
The investment in the Condoroma enterprise to date is $3.3-million, bringing the total investment of the Hochschild organization in mining operations in Southern Peru to over $8-million.

Hochschild & Cia. commenced their operations in Peru in 1925 and since that time have participated actively in the development of the national mining industry. The organization works its own mines and buys ore from other miners, to whom it gives financial help and technical assistance.

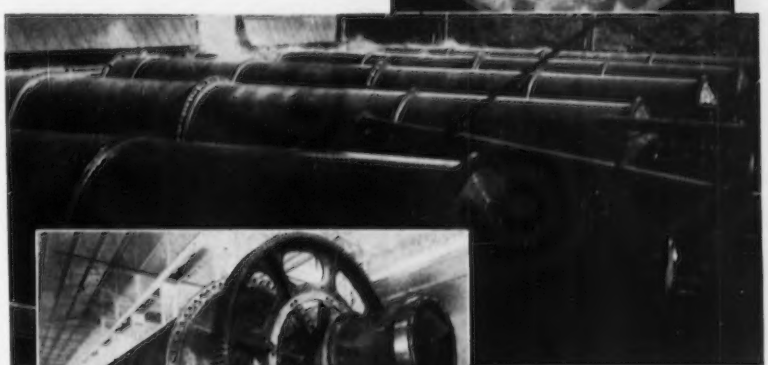
The other Hochschild mines are operated by the Compañia de Minas del Peru, S. A., an associate concern. Company operates on a large scale in San Antonio de Esquilache, a lead and zinc property near Puno, and in Sucuitambo,

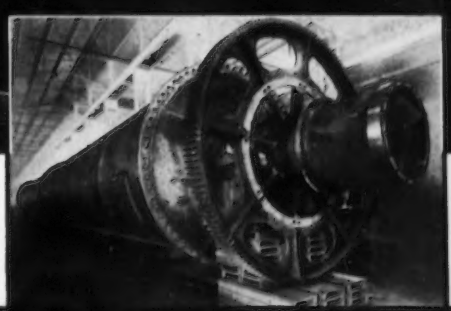

# Ruggles-Coles In The Caribbean

In Cuba, Haiti, and Jamaica, Ruggles-Coles Dryers and Coolers are in use.



TEN-FOOT DIAMETER ROTARY DRYERS





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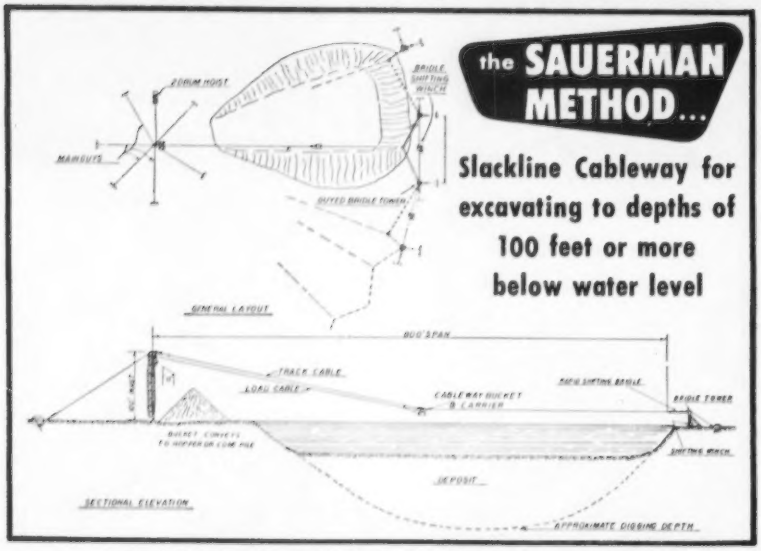
# HOW TO GO UNDER WATER AND GET ALL THE MATERIAL FROM YOUR DEPOSIT


the SAUERMAN METHOD...
Slackline Cableway for excavating to depths of 100 feet or more below water level
GENERAL LAYOUT
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APPROXIMATE DIGGING DEPTH

*Above drawing was prepared for a specific slackline installation and does not represent maximum spans. Rapid shifting bridle is not needed for many deposits.*

*Cableway at Cabinet Gorge Dam digs and hauls from tailrace 1000 ft. away.* **(Full details in Sauerman News No. 143.)**

*New York gravel producer switched to cableway for underwater operation of his pit. Average haul is 600 ft. from a 50-ft. depth* **(Sauerman News No. 141).**

Deposits below water yield new profits with a long reaching Sauerman Slackline Cableway. On job after job this machine has proved to be the most efficient for this type of operation. It is especially effective where the material to be excavated has good depth and will flow to the bottom of the cut. For shallow deposits or non-caving material a rapid shifting device is used to change the line of operation.

One man controlling the hoist digs, conveys and elevates from deposit to plant over spans of 1000 ft. or more . . . across streams, lakes, bogs or deep pits. The powerful load line pull insures digging penetration. Tensioning the track cable lifts the bucket which is inhauled at high speed and dumps automatically. Gravity return completes the fast operating cycle. Bucket capacities range from ⅓ to 3½ cu. yds.

To get fast, economical long range excavation, and the shortest, most direct way from pit to pile use a slackline cableway. Contact Sauerman for specific recommendations. No obligation. Request Catalog C, showing detailed specifications and photos of slackline cableways in action on all types of deep digging jobs.

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## Condoroma *(Continued)*

a silver and gold mine north of Arequipa.

Assisting small miners in all parts of the Republic, the Hochschild Organization has established offices in all important mining centers—such as Arequipa, Cuzco, Huancavelica, Huaraz, Huancayo, Juliaca, Pisco, Tacna and Trujillo—where the small miner can sell his ores, receive advances on future production and buy materials and equipment necessary for his work, without loss of time and the additional expense of traveling to the capital. Furthermore, the company employs numerous mining engineers, geologists and metallurgists, who are constantly traveling in the country and offering, without charge, technical advice to miners, making studies of the mines and instructing operators in the latest technical processes. This represents an important service to the small miner, who, for economic reasons, could not afford these consultations. The Hochschild Organization today has 822 employees and 2,755 workmen on its payrolls.

# IN THE U. S.

## ALASKA

**Diamond drillers at one "dry mountain" prospect are reportedly swearing mightily** about not being able to keep the water flowing through a long supply line of the new plastic pipe they had had air-dropped to them. The first time the water quit, they sent their helper up the pipe line to discover the trouble. He promptly came rushing back, white-faced, to report a bear chewing on the pipe. Since then, the bear had returned numerous times to again chew holes in the pipe, necessitating shutdowns while the pipe was patched.

## ARKANSAS

**Research work at Reynolds Metals Co. pilot plant at Hurricane Creek** has suggested, according to Dr. Theodore Tiemann, that Jamaican red mud may become a substitute for cement and limestone in asphalt mixtures for highways.

Dr. Tiemann noted that the colored material might also be used to tint cement and concrete for highway guides and for paint and specialty iron products.

The red mud is a by-product of alumina production at Reynolds Jamaica.

## CALIFORNIA

**Citizens of the historic mining town of Randsburg, 100 miles east of Bakersfield, are confident that their current struggles for survival in the face of tungsten mine shutdowns and local water shortages will be successful.**

This summer the water shortage be-

# HOLD EVERYTHING!

## BIG NEW SERIES E TRAXCAVATORS*

NOW AVAILABLE

**For the extra-rough jobs**

The tough reliability of the No. 955 and No. 977 has already been field-proved. In the new Series E, these Cat-built Traxcavators give even greater performance in applications that put top stress on the guts of your equipment.

These CAT* Series E Traxcavators come equipped with a new heavy-duty, extra-sturdy undercarriage for longer life, lower maintenance costs, and better job production when the going is really bad.

You get—

*New* heavier idlers
*New* solid sprockets
*New* and tougher track rollers with frames and guard of heavier construction
*More* ground clearance
*Lower* center of gravity for better handling and more stability
*Lower* transmission speeds for more bucking power

No change in the maneuverability, big capacity and always dependable power of these great machines, of course.

For all the details on this improved Traxcavator line, phone your Caterpillar Dealer—same man you call for expert service and replacement parts that don't let you down.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

**CATERPILLAR***

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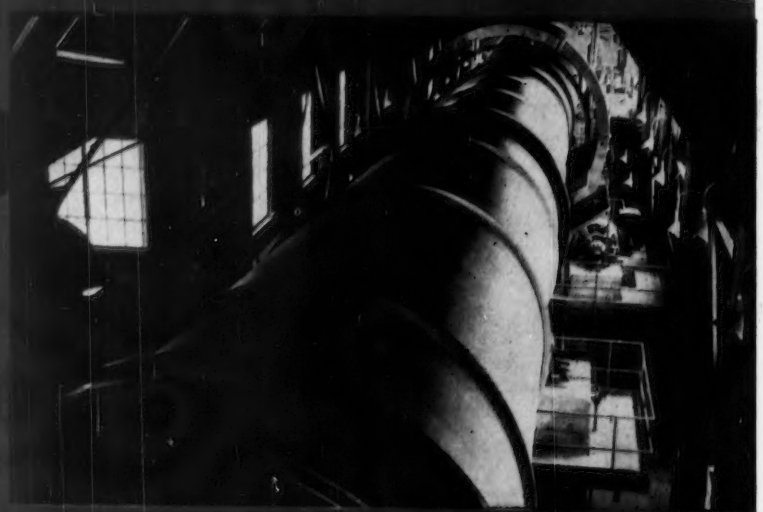
**ONE GOAL: To concentrate our capabilities, resources and experience on the design, manufacture, distribution and service of job-tested heavy equipment.**

# SMIDTH

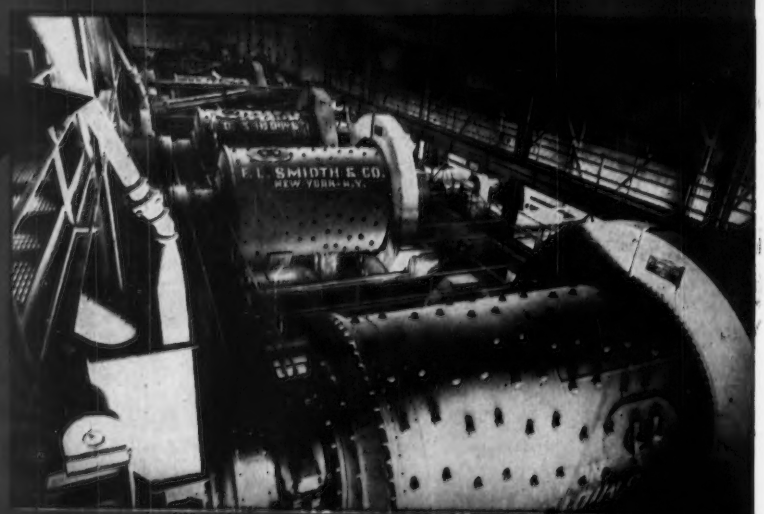
## Rotary Kilns

For sintering, nodulizing, calcining, desulphurizing, oxidizing and reducing roasting—coolers, precoolers, preheaters, recuperators—and auxiliary equipment.



## Grinding Mills

Ball mills, tube mills and multicompartment mills—open or closed circuit—wet or dry grinding also airswept for grinding and drying.

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"Three units work sixteen hours a day. *Eight hours hauling rock in the quarry. Eight hours stripping overburden.* All we do is change drivers.

"Tremendous load carrying ability in quarry hauling and in stripping. Have handled 39 tons without difficulty. Average payload 30-34 tons.

"Four years in brutal daily service and never a breakdown. 50% increase in quarry production to 4,500 tons per day. One full eight-hour shift eliminated."

↓ loading with six-yard shovel in quarry shuttle service

↓ loading with dragline bucket in stripping operation

↓ driver has safe view of dumping over bank in fill area

**EASTON**

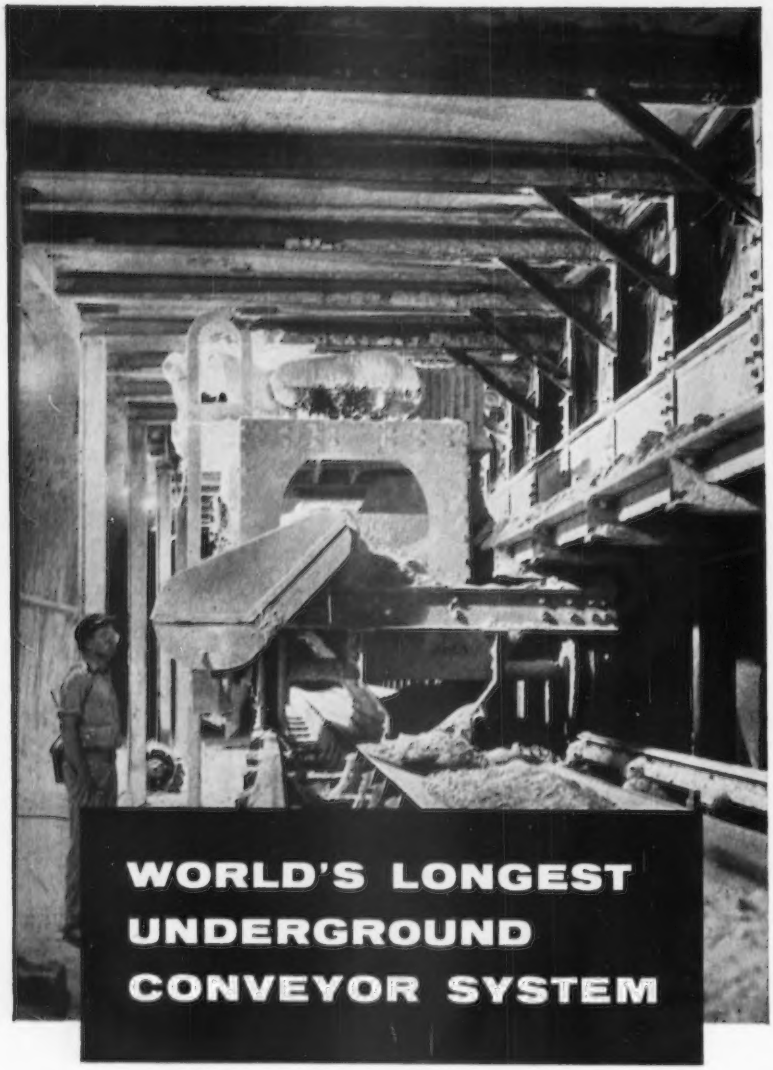
**TD-1832H HYDRAULIC SIDE DUMP**

*gooseneck trailer • fully automatic drop door*

**Easton Car & Construction Company • Easton, Pa.**

B-1077

**Easton off-highway trailers and truck bodies are sold through truck and tractor manufacturers and their contract dealers.**




This rotary plow feeder is part of a 45-unit, 7½ mile Hewitt-Robins belt conveyor system located 1000 feet underground in Carlsbad, N. M. The system is designed to carry up to 550 tons of potash ore per hour from mining areas to a storage pit. Here the H-R rotary plow feeder scoops ore onto another conveyor for its trip to the refinery skip hoist.

As in hundreds of other industrial installations, this Hewitt-Robins belt conveyor system effects a material saving in handling costs. To find out how H-R products and services can help you, consult your classified telephone directory for the nearest H-R representative, or contact Hewitt-Robins, Stamford, Connecticut.

HR HEWITT-ROBINS

CONVEYOR BELTING AND IDLERS...POWER TRANSMISSION DRIVES
INDUSTRIAL HOSE...VIBRATING CONVEYORS, SCREENS & SHAKEOUTS

## California *(Continued)*

came so acute several times that water had to be hauled in by truck to raise the level in the central supply tank maintained by the Randsburg Water Co. A citizens committee made up of representatives of the three communities served by the company, Randsburg, Johannesburg and Red Mountain, met often to try to find some solution to the highly controversial problem.

Instead if the $4 surcharge approved for levying against consumers by the Public Utilities Commission, the citizens committee recommends that water rates be raised by one third, thereby distributing increased costs according to the amounts of water used. But even if water rates are increased, the solution of the problem seems to depend on an aggressive program to deepen the company's one producing well, the main source of supply since the 1890's.

Meanwhile miners thrown out of work with the shutdown of the Surcease Mining Co. have been dispersing to other jobs. Fortunately other jobs are available. Some of the displaced miners are working at borax works in Boron, others are working in Ridgecrest where the Navy has its desert ordnance test station and others are mining gold at Randsburg.

Recent Congressional action in declining to appropriate funds for tungsten mining subsidies forced the large-scale Surcease Mining Co. shutdown at Atolia. At least 40 leases in the area suspended operations along with Surcease.

Rand-area miners began stockpiling tungsten last November when U.S. subsidy funds ran out. In many cases mining operations continued in the expectation that the Government would appropriate funds to continue the program. Paul Hoefling, manager of Surcease, said that failure to appropriate funds closed as many as 75 mines in the area.

**Richard Bright of Red Mountain reports that gold ore he is surface-mining** at old Yellow Aster diggings here is bringing $40 a ton. Bright was thrown out of work when the Surcease Mining Co. tungsten operations at Atolia closed down.

**Atomic Energy Commission recently granted a license to process uranium ore to the Verdi uranium mill** near Mojave, Mitchell G. Kovaleski, president of Verdi, announces. Initial production at the mill was 25 lb of commercial-grade uranium oxide. It was recovered in a test run of two and one half tons of .25 ore, according to reports.

Capacity of the mill is said to be 100 tpd. Metco, Inc., has a joint interest in the operation.

## COLORADO

**Gold receipts at Denver mint totaled 344,465 oz worth $12,056,275 in first half of 1957** compared with 333,012 oz worth $11,655,375 in 1956. Silver total dropped to 86,833 oz worth $78,662 from 1,768,755 oz valued at $1,600,772.

**Capitol Uranium Co. has extended the**

**The only REVERSIBLE cap and adapter made...**

# Try this on- for SAVINGS!

**Service-proved WEARPACT Cap Type Tooth —with foolproof retainer—cuts digging costs to record lows . . . even in taconite!**

Probably by now you've heard of Wearpact Steel--the alloy with a combination of hardness and toughness not available in any other commonly used alloy.

Here's a new tooth and adapter design* cast in longer-wearing Wearpact . . . the ASF Cap Type Tooth and adapter —the *only* such tooth and adapter that's reversible for longer life. Note that the tooth itself is self-sharpening. Keeps on *slicing* through the ore and overburden—and when finally worn, there's less metal to throw away. *The tooth locks securely to the adapter.* No ASF retainer has ever failed in service.

As for service life, the cost-per-ton figures in large mines speak for themselves. Lowest of any tooth on record! Give this dollar-saving tooth a try! Write today to arrange for an installation.

**Cut your costs with WEARPACT**

**CAST ALLOY STEEL**

A PRODUCT OF

**AMERICAN STEEL FOUNDRIES**

3700 Canal St., Indiana Harbor, Indiana

*Patent Pending.

screen has special profile to increase wearing surface

**MIGH-TEE KLEENSLOT**
G187 .437 high—.187 wide
GB187 .500 high—.187 wide

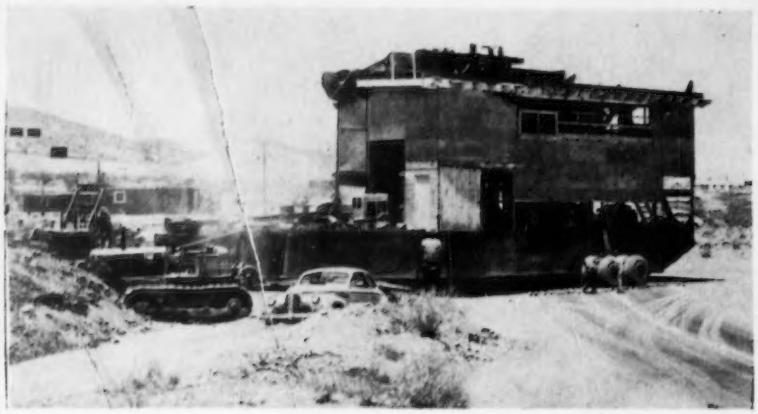
Newest addition to an already complete line of preparation screens is the rugged Migh-Tee Kleenslot. Designed and developed for heavy duty applications where precision is essential. Openings larger than ordinarily considered economical and openings as small as ⅛ m.m. are easily maintained by this screen.

Unique assembly (patent applied for) contributes towards non-blinding, non-clogging performance. The Migh-Tee Kleenslot is also adaptable to vibrator applications and can easily be interchanged with other types of Kleenslot Screens without mechanical changes.

Constructed of high abrasion resistant stainless steel. Furnished in guard bars and special shapes or designs.

Write today
Our engineering staff will promptly assist you in solving your screening problems. Be sure to include specifications.

WEDGE-WIRE CORPORATION
Wellington, Ohio



**CROSSING THE HIGHWAY** on an 18 mile-trip, Atlas Consolidated Mining's dredge rides planking under its unusual carriage. Job was by Western Dredging.

# Dredge Company Employs Unique Carriage

TAKING A LEAF from the book of its opposite number, Western Dredging & Construction Co. transported one of the world's slowest moving vehicles on the wheels of one of the fastest. A 400-ton dredge was rolled 18 miles across Southern California desert roads on a landing gear and wheels from a B-29 bomber.

Destination was Atlas Consolidated Mining Corp.'s new high-grade tungsten operation in Kern County's Red Mountain district, where dredge will mine ore which samples 1 lb tungsten per yd and about $6 worth of gold per yd.

New mine site is only six airmiles from the former home of the "Roaring River" dredge, but indirect route avoided most highways and power lines. Western jacked up the 57x175x40-ft hull and lowered it onto the homemade carriage: landing gear welded to the front end and four wheels on a welded I-beam on each side. Trip took six weeks. Water will be hauled (and later piped) from the former site to float the dredge. Machinery is run by electric motors powered by 2800kw, 2200v generator, driven by a 3500hp engine. Dredge handles 125 yd per hour. Ore will be jigged.

## Colorado *(Continued)*

**orebody in its Carrizo mine** an additional 130 ft eastward. Drilling has disclosed the topping of another orebody approximately 80 ft from present underground heading to the north. Charles W. Yetter said that the ore ranges in thickness up to 7.6 ft with uranium oxide values up to 0.46% for this new ore. Company reports shipment of 500 tons of ore to the mill at Durango, Colorado from May 14 to June 28.

**Resurrection Mining Co., Leadville, will discontinue mining and milling operations.** Statement was made by superintendent Barney Greenlee at the company's New York office. Resurrection has been operating under a joint working agreement with American Smelting & Refining Co. whereby the two firms were partners for working of their holdings through the Irene and Helena shafts. Declining metal prices was given as cause for the shutdown. Equipment will be removed from all operations and pumps will be pulled at the Helena but, for a time, pumps will operate at Irene. Two months are needed to complete milling of ore on hand and to close mills.

**Production of thorium and other metals in Wet Mountain area will be result of joint operation by Trabella Uranium Mines and Trans-Mountain Uranium Mines.** S. P. Balcomb, president of Trans-Mountain, said both firms have agreed to obtain and produce from 39 thorium and rare earth claims, approximating 780 acres, in Wet Mountain Valley area.

**Colorado stockholders of Shenandoah-Dives Mining Co.** received notices of a special meeting for purpose of considering a merger with Marcy Exploration & Mining Co., a Delaware corporation.

**Rex Uranium Corp. recently acquired 13 claims near its presently producing mines.** Two claims in Long Park area, 8 claims in Gypsum Valley and 10 claims in the La Plata Mountains. Firm also has an option on a base metal property near Telluride.

**Newly elected directors of Leadville Lead & Uranium Corp.** were Kenneth W. Miller, of Denver, and James Tiffany, of Fairplay. Re-elected directors were Dr. Robert G. Risk and Allen W. Clowes, of Indianapolis; Harvey Tedrow, of Denver; Hans Lundberg, of Toronto; and Arthur S. Dewing, of Newton, Mass. Dr. Risk reported good progress in exploration program on firm's properties consisting of 200 claims in the Horseshoe mining district in Mosquito Range between Fairplay and Leadville.

**Four mine operators signed DMEA contracts for uranium exploration during March, April or May.** Under contract terms, Government pays largest share for

Longyear

# New approach to underground drilling!

## Longyear Hi-Speed Air Leg Diamond Core Drill

## Powerful . . . Portable . . . One Man Operated

Now, Longyear applies the advantages of Air Leg design to underground coring. The new Hi-Speed Air Leg is a drill that one man can carry, set up easily and operate efficiently. Powerful and rugged, it requires *no spraging or bracing* . . . uses standard E or XRT tools . . . is driven by a 10 hp air motor and mounted on a powerful four-inch Air Leg that provides ample bit pressure.

The drill operates either in line with the Air Leg or at an angle to it, and drills up to sixty feet. Field reports emphasize that this powerful, compact core drill can be used in confined spaces. Write for information and specifications on this important addition to Longyear's world acclaimed line of Diamond Core Drills.

**E. J. LONGYEAR CO.** General offices: Foshay Tower, Minneapolis 2, Minn. • Cable Longco.

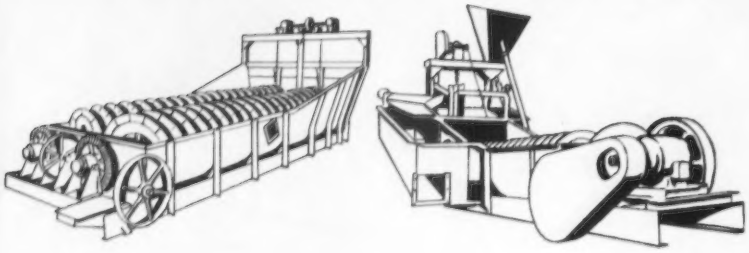
CANADIAN LONGYEAR LTD., North Bay, Ontario • LONGYEAR ET CIE., Paris, France

*Diamond Core Drill Manufacturers • Core Drilling Contractors • Mining Engineering and Geological Consultants*

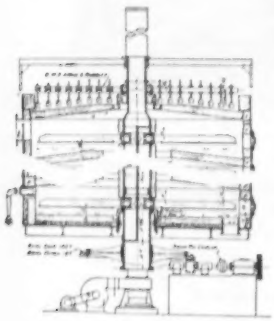
THE WORLD IS OUR WORKSHOP

# CIW COST-CUTTING EQUIPMENT

## AKINS CLASSIFIERS AND HEAVY MEDIA SEPARATORS



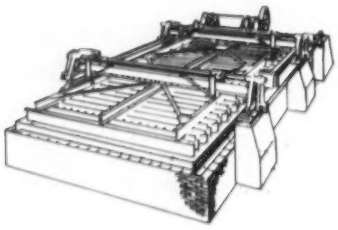
The Akins Classifier was originally developed, in 1908, for use in closed circuit with a ball mill. Its outstanding success led to many other profitable applications where it has demonstrated its superiority...dewatering and recovering fine solids; sand and slime separations; washing coal, sand, and oyster shell; desliming and de-oiling phosphate rock and concentrate; sink-float concentration; and many others. The Akins is made in sizes up to 84", simplex and duplex, in two types—small and large settling pool. The Akins Heavy-Media Separator is the only unit available which can make a 3-product separation in one machine from one medium cleanup circuit.



**SKINNER ROASTERS AND DRYERS**—For roasting, calcining, and drying ores, clays, limestone, limestone mud, flotation concentrates; decomposing oil sludge in the process of recovering sulphuric acid. Coal, oil or gas fired. Sizes to 23'6" inside diameter; up to 12 hearths.

**LOWDEN DRYER**

For drying flotation concentrates, graphite, clays, ground minerals, paint fillers, pigments, various precipitates. Can use most any fuel including live steam and waste heat.



**VEZIN SAMPLER**—A continuous sampling device generally used for 5 and 10% cuts on crushed feed. Alloy white iron cutting lip. Rubber or abrasion resistant plate lining inside. Compact direct driven faced tooth bevel gear drive. Easy addition of mixing barrel, operated from same drive.

## COLORADO IRON WORKS CO.

DENVER, COLORADO

A SUBSIDIARY OF THE MINE & SMELTER SUPPLY CO.


## Colorado *(Continued)*

the exploration work. New Idria Mining & Chemical Co. of Mesa will spend an estimated $53,444 with Government paying $40,083 of the total; Lisbon Uranium Corp. of Mesa, breaks down $45,572 and $34,179, and Universal Metals Co. of Saguache, $29,475 and $22,106. W. H. Gaddis of Fremont, Wyo. has a contract to total $64,784, with Government's share set at $48,588.

**Uranium strike near Canon City** has been reported to its stockholders by Four Star Exploration Co. Company says assays have run as high as 0.50% $U_3O_8$ and higher grade ore has been mined since receiving these assays. Four Star has started its shaft and ore being mined is adjacent to a major fault-zone in a formation of black hornblende schist. Thirty-seven tons of ore had been stockpiled before shaft operations started.

**Two thousand prospectors staked claims** in one of Colorado's greatest land rushes on one hundred thousand acres of uranium land opened July 20 by the AEC. Montrose, Nucla and Uravan, in the San Miguel Valley, said that many others continued to arrive at county seats to record their claims.

**Smelter site 2½ miles northeast of Saguache** has been purchased by W. M. Dickerson and associates. Location was chosen for its accessibility to area's mining districts. Work continued to completion and plant now in operation, Dickerson reports. Office, laboratory, well and pump house, repair shop, generating unit, 500-ton ore storage bins, and settling pond are incorporated into the smelter plant. Mill-smelter building, which houses completed smelter machinery, has room for milling plant now under construction.

**Colorado's production of metals, nonmetallics, oil and gas for 1956 was $406,031,523** as compared with a total of $381,709,013 for 1955. Figures were published in a report by Walter E. Scott, Jr., Commissioner of Mines.

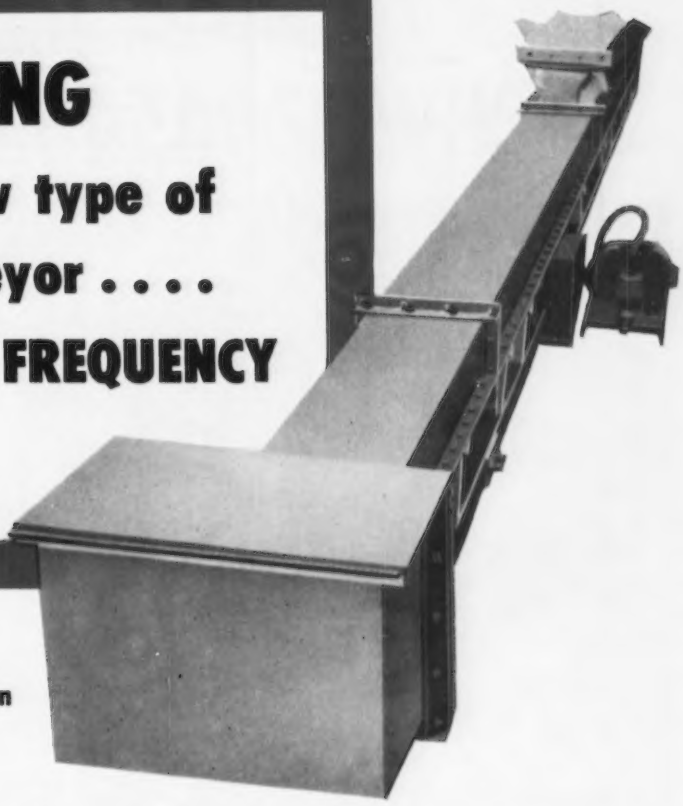
**Colorado's largest gold producer,** Golden Cycle Corp., several years ago acquired rights and explored land containing uranium. It has now acquired a joint operating interest in large uranium holdings in South Dakota and eastern Yyoming with intention of entering into uranium development and production on a larger scale. Merrill E. Shoup, president of Golden Cycle, and T. R. Gillenwaters, president of Giant Resources, Inc. revealed that their companies have entered into a joint operating, development and production program on uranium properties which were formerly owned by Giant Resources.

**National Farmers Union of Denver appears assured of first lease ever to be issued on oil shale lands** by a western state.

The Utah State Land Board has indicated its willingness following hearings at Salt Lake City of issuing the lease to Ben Olsen, Ernest and J. A. Olsen, all brothers, originally of San Bernardino, Calif.

# ANNOUNCING

## an entirely new type of vibrating conveyor . . . . THE NATURAL-FREQUENCY AIRSLIDE!



developed by
**CARRIER** Conveyor Corporation
and the **Fuller** Company

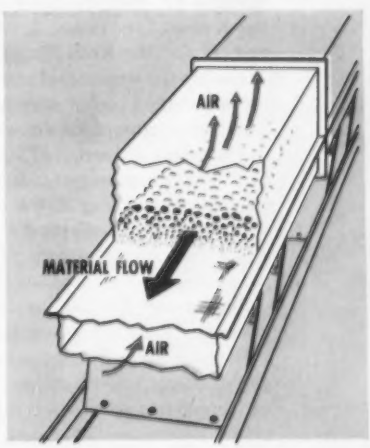
## Conveys ultra-fine materials, plus lumps— upward as well as horizontally or downward!

Now, for the first time, processors of finely-divided materials can take full advantage of the vibrating conveyor. The new Natural-Frequency Airslide, developed jointly by Carrier and the Fuller Company, combines the operation of a vibrating conveyor with that of an Airslide. As a result, it will convey even the most finely-divided materials, by themselves or in combination with lumps—horizontally *or even upward!*

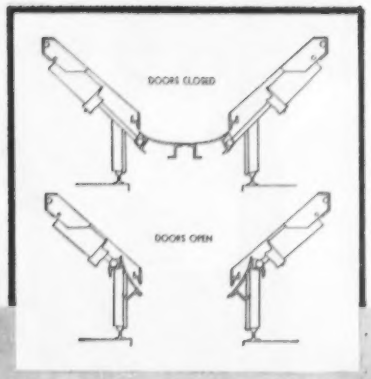
And look at these other important advantages: The Natural-Frequency Airslide is completely dust-proof because it's completely enclosed. There is no loss of headroom, because it isn't necessary to decline the conveyor. Large chunks—or dust—or both, can be handled efficiently, rapidly. Maintenance and down-time are appreciably less than for any other type conveyor.

*Here's how it works:* The rectangular trough of the vibrating conveyor is divided into two parts by a porous membrane. The upper portion of the trough is used to carry the material, while the lower part is used as an air chamber. In operation, a small, *non-critical* amount of air is pumped into the lower chamber and passed through the membrane beneath the material being conveyed. In this way, air which would normally be pulled down through the conveyed material, is balanced. This air balance, plus the Natural-Frequency vibrating action, conveys the finest materials at speeds and in mat depths which actually exceed those achieved for coarse products.

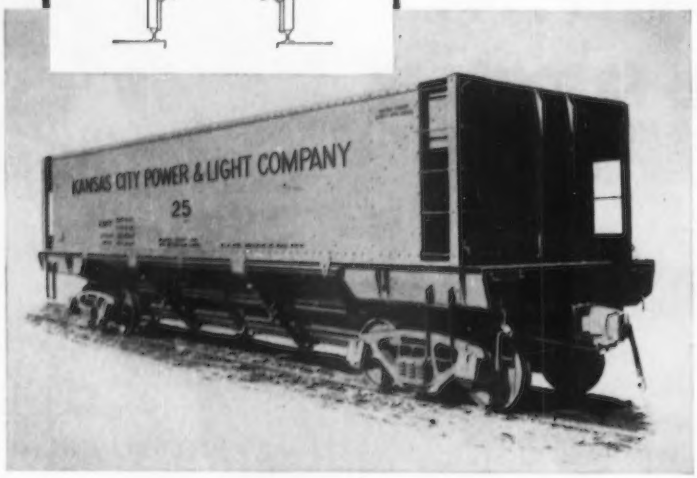
Get all the facts — now. Write today to Carrier Conveyor Corporation, 213-A North Jackson Street, Louisville, Kentucky.




# CARRIER
## -NATURAL-FREQUENCY®
# CONVEYORS




Note the clearance when Baldwin hopper car clamshell doors are open. When unloading, the doors provide a discharge opening of 3 ft. 4 in. x 22 ft. 6 in. and are completely clear of the hopper opening; so there is no possibility of fouling them. When closed, the doors lock into position automatically and cannot open accidentally.




## New 100-ton Baldwin coal-type hopper cars cut switching costs more than 25%

The Eddystone Division of Baldwin-Lima-Hamilton is now building 65 coal-type hopper cars of 100-ton capacity—35 for the Kansas City Power & Light Company, Kansas City, Mo., and 30 for the River Queen Coal Company, Greenville, Ky. These are the largest coal cars ever equipped with the automatic, air operated, clamshell door mechanism, a patented device which provides instantaneous dumping.

These cars will weigh 65,000 lb., and have a level full capacity of 119 cu. yd., a heaped capacity of 140. Since three of them will haul more than four 70-ton cars—till now the largest coal cars with Baldwin's automatic door mechanism—these 100-ton giants will reduce switching costs more than 25% on main line tracks, where charges are based solely on a per car rate.

Similar cars designed to carry 100 tons of ore but of smaller cubical capacity are now being built at Eddystone.

Baldwin hopper cars are made in all capacities and all track gages. Rugged construction throughout guarantees a long life of trouble-free service and minimum upkeep costs.

The world's largest selling dump car—the Western —is also built by Baldwin. Write us today for complete information on both dump and hopper cars.

BALDWIN · LIMA · HAMILTON

Eddystone Division

Philadelphia 42, Pa.

Hydraulic turbines • Weldments • Dump cars • Nonferrous castings


## Colorado *(Continued)*

The brothers, in turn, have an agreement with NFU regarding the 16,000 acres of oil shale lands owned by the state in the Bonanza area of Uintah County, Utah.

This is same area of American Gilsonite Co's important gilsonite project which was put on commercial gasoline and coke producing basis last week. (See p 106.) No gilsonite involved in the shale lease.

Charles F. Brannan, former U.S. Secretary of Agriculture and now secretary and general counsel to NFU, argued for a 5% royalty to be paid the state during next 10 yr. Royalty would start on issuance of lease and be based on gross revenues of the operation. The board appears agreeable to this.

Brannan said that the NFU would launch a research project on mining and retorting of the shales. He said that NFU would expect to associate itself with a partner in any commercial venture. He cited the association with Phillips Petroleum Co. in fertilizer ventures, in the New Mexico area, as an example of this.

Significantly, the oil shale area is near the lines of Salt Lake Pipe Line Co. (Standard of California) serving Rangely and Red Wash fields and which bring crude to Salt Lake refining district.

So far as can be established, the shales in the Bonanza-Watson area are for the most part relatively deep laid, as opposed to deposits near Rifle in Colorado's Piceance Creek Basin.

However, there are numerous outcrops of relatively good grade shales in canyons in the region and water would be available from both the Green and White Rivers.

Disposal of huge ash wastes from oil shale mining and retorting would be a somewhat easier problem in this area than in the Colorado oil shale region, it is maintained.

Biggest potential, however, is existence of crude common carriers and a market for the retorted shale oil in the Salt Lake Refining district. This may be contrasted with Union Oil Co. of California's problems in the proposed transport of semi-refined shale oil from its Colorado operation all the way to southern California.

In outlining its policy for shale leases, the state land board rejected competitive bidding but stressed that it was not interested in leasing state shale lands to those wishing to hold them for "speculative purposes." The board will consider financial ability of a firm or group of individuals to carry forth a commercial shale enterprise in granting leases.

## IDAHO

**Hecla Mining Co., Coeur d'Alene District firm, has moved its exploration headquarters from Wallace to Spokane** in accordance with plans for acceleration and expansion of exploration activities. Herbert E. Harper, chief geologist, is in charge. He will be assisted by James J. Quinlan, exploration geologist.

New grade of wire rope developed for toughest jobs—

# HAZARD LAY-SET VHS® *15% stronger*

*for example:* **A Strip Miner Gets 60% More Service from Lay-Set VHS Dragline**

• Everywhere operators are talking about the new grade of rope known as VHS which means Very High Strength. They have heard about its great service on jobs such as draglines, scrapers, shovel hoists, logging chokers and rotary drilling.

"I always thought one line was pretty much like the next until we gave VHS a try on our Lima 2400," said Mr. Gene Bartoli, owner of A&B Construction Company, Nanticoke, Pa. "We're still using our original VHS dragline after 3 weeks of rough going. This is at least 10 days more service than we ever got from any other rope."

That is because LAY-SET VHS is tougher and more wear-resistant as well as 15% stronger. VHS also comes with factory built-in lubrication which adds to its service life.

If your work calls for a superior grade of rope, order LAY-SET VHS—it's the best you can buy. If you don't need its greater strength and ruggedness, order LAY-SET preformed made of Improved Plow Steel. This was the highest grade until our engineers perfected VHS. This great new rope is now available at LAY-SET distributors everywhere. • ***For further details write for Bulletin DH 513-H.***

**HAZARD WIRE ROPE DIVISION**
**American Chain & Cable Company, Inc.**
Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn.

# Announcing NEW TD-6 Under

U. S. BUREAU OF MINES

**APPROVAL No. 2410**

The components for this new International Drott underground mining tractor were safety-tested and approved at the Bureau of Mines Laboratory, Pittsburgh, Pa.

**ALREADY PROVEN IN WORKING MINES,** the rugged TD-9 is breaking production records in limestone, iron ore, uranium, salt, and tunnel work. Height is a low, "trolley-clearing" 6 feet! Tractor uses dependable, 24-volt, direct electric starting and lighting system. Rear-mounted, 40-gallon-capacity reserve water tank is sufficient for a full shift.

**EASILY-REACHED, STAINLESS STEEL SCRUBBER** requires minimum maintenance and only periodic pressure hose cleaning. Scrubber and engine blower fan render exhaust gas harmless to personnel, minimizes fire hazard when used with adequate mine ventilation.

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## The Feature That Makes a Great Truck Even Greater

# ground Mining Skid-Shovel!

## Joins proven TD-9 to give you two International Drott feature-packed mining tractors!

Now, you get exclusive wide work range, low equipment investment, and all other exclusive advantages for underground mining in two International Drott underground mining Skid-Shovels...the new 55-hp, 1 cu yd TD-6, and the already proven 71-hp, 1½ cu yd TD-9!

The new, big-capacity TD-6, like the TD-9, meets rigid U. S. Bureau of Mines safety standards (Schedule 24) for underground, non-coal mining. Both machines now feature the new, short-coupled, stainless steel exhaust scrubber—that cools exhaust to a maximum of 160° F., while efficiently dissolving irritating aldehydes with water-bath turbulence. The new design also provides blower fan action on the final exhaust which breaks up noxious gas concentration at a ratio of 40 parts fresh air to one part exhaust.

In addition, low, 5-foot profile and "lean-over" features of the new, compact TD-6 provide unmatched full-load maneuverability, even in the most cramped quarters. You get all the famous, above-ground exclusives, too, like triple-power, pry-action break-out, shock-swallowing Hydro-Spring, and optional Four-In-One providing 'dozer, clamshell, carry-type scraper and regular Skid-Shovel actions.

Prove to yourself the great versatility, productivity, operating ease, and approved safety of the new underground International Drott TD-6 Mining Skid-Shovel. See your International Drott Distributor for a demonstration of the new TD-6 and TD-9!

### NOW—get these versatile INTERNATIONAL DROTT attachments for both tractors!

Exclusive Four-In-One is a dozer, bucket, clamshell, and scraper, all in one.

95-inch bulldozer blade mounts directly onto Skid-Shovel lift arms. Easy to control!

Bullangledozer blade can be angled to either side and has power tilt from operator's seat.

Rock fork constructed of super-strong alloy steel... withstands abrasion of loading hard, heavy minerals.

Third, extra valve of Skid-Shovel controls rear-mounted, heavy-duty scarifier.

Low profile, 2-prong grapple with top grab arm loads ties or mine props with full control.

**LARGE, 28-GALLON CAPACITY RESERVE WATER TANK** on left fender of TD-6 provides sufficient capacity for full, eight hours. Low-mounted tank is cushioned with foam rubber, permits operator to lean over comfortably and safely under extremely low headings, provides excellent rear visibility. TD-6 uses 12-volt direct starting system.

**INTERNATIONAL® CONSTRUCTION EQUIPMENT**

**International Harvester Co., 180 N. Michigan Avenue, Chicago 1, Illinois**

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.

## The Feature That Makes a Great Truck Even Greater...

# The Autocar Driver Cab

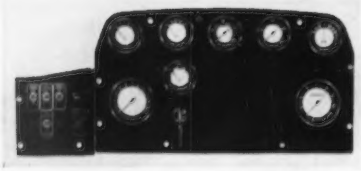
### Designed with your driver's comfort, safety in mind

Cab is built like a skyscraper around a rigid structural steel frame. All welded, no rivets. Cab is spring-mounted to frame, absorbs shock, rolls with weaving. Heavy gauge sheet metal preserves that new look. All aluminum cab available; saves approximately ⅓ in weight.

Full-Adjust Seat, adjustable at many different locations, is almost infinitely adaptable to any driver's requirements. Levers permit driver to change posture while in motion.

1. Lever moves front of seat up or down.
2. Lever moves back of seat up or down.
3. Release to move seat back and forth.
4. Lever adjusts back rest.
5. Arm rest moves up out of way.
6. Entire seat platform can be raised or lowered.

Big windshield, curved to eliminate sidepost obstruction, pushes out in an emergency under 40 lb. pressure.



Instruments, grouped on panel directly in front of driver, are designed for long, trouble-free performance. Electrical terminals are clinched, soldered, and covered with rubber boot. Circuit breakers speed restoration of service in the event of a short circuit.

Extra-large rear window with optional sliding panel for ventilation; also permits driver to direct winching.

These are only four of many features that make the Autocar Driver Cab the most completely satisfactory cab for use on or off the highway. To help your drivers stay fresh during a full day's work, the same careful attention has been devoted to every detail of the cab. When you order your next truck or tractor, order it with your driver's comfort and safety in mind and buy an Autocar. See your White-Autocar distributor today.

## AUTOCAR TRUCKS

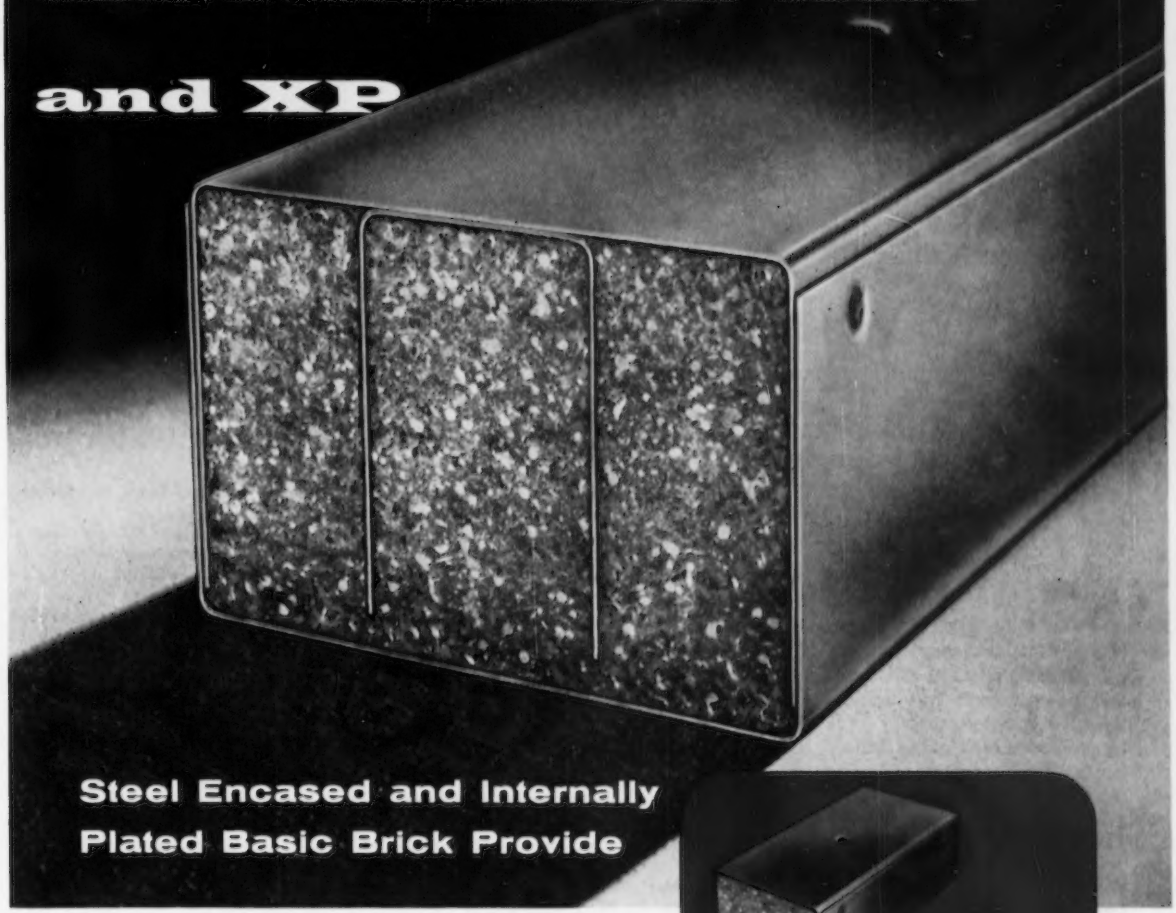
**AUTOCAR DIVISION, The White Motor Company**

**Exton, Pa.**

White Autocar

## A NEW Harbison-Walker Service-Proved Product

# METALKASE XXP and XP



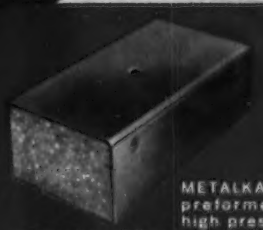
**Steel Encased and Internally Plated Basic Brick Provide**

- **greater spalling resistance**
- **reduced peeling tendency**

METALKASE XXP are chemically bonded basic brick with two internal plates, formed under high pressure, and are furnished in standard sizes, suspended arch and other shapes. They are available in various compositions. In the illustration the METALKASE XXP brick is cut to show the plated construction. These plates extend through the length of the brick.

METALKASE XP brick, having a single internal plate, are made in both chemically bonded and hard fired basic brick of various classes. They are available in standard sizes and many special shapes. These brick are used in various particular applications with great benefit.

Extensive use in service clearly demonstrates the superior spalling resistance of the internally plated brick, and as the result of improved stress relief, appreciably reduced tendency to peel.



METALKASE brick, preformed under high pressure and encased on all four contact sides by welding, in 22 gauge steel.

METALKASE brick with 3-sided steel enclosure, especially suited for electric furnace side walls and other specific applications.

**Other Metalkase designs**

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KERN INSTRUMENTS INC.
120 Grand St., White Plains, N.Y.

**LORADO URANIUM MINES'** new custom contractor at Beaverlodge will expand.

# Lorado Opens $9.2-Million Concentrator

NEW $902-MILLION CUSTOM CONCENTRATING MILL of Lorado Uranium Mines, Ltd, was officially opened Aug. 5 at Beaverlodge in northern Saskatchewan.

This brings to three the number of mills operating in this field and boosts total milling capacity to 4,150 tpd of uranium ore. Tonnage to be raised shortly to 4,400 tons when Lorado, which is treating ore from several mines in the area, completes a plant extension now underway, raising capacity from 500 to 750 tpd.

The new mill will be largest custom mill in northern Canada when its extension capacity is reached. The company has a contract with the Canadian government, through government-owned Eldorado Mining and Refining Ltd. to sell uranium oxide to it to the value of $64,480,000 by Mar. 31, 1963.

Initially, Lorado will be milling 100 tpd of its own ore. It has contracts to mill ore for five properties at the following ultimate rates: Cayzor Athabaska Mines, Ltd. 250 tpd; Lake Cinch Mines, Ltd. 150 tpd; St. Michael's Uranium Mines, Ltd. 75 tpd; National Explorations, Ltd. 50 tpd; and Black Bay Uranium, Ltd. 25 tpd.

Of these properties, St. Michael's Uranium is closed down and Lorado will mill ore from its stockpile. National Exploration, Ltd. is in the process of shutting down, and ore from its stockpile will be milled also in the meanwhile. On both properties it is planned to resume production in the future.

The only custom milling in the Beaverlodge area, so far, has been done by Eldorado mill. Its custom ore has come only from the easily accessible surrounding properties. The Lorado mill, it is believed, will fill an urgent need since the terrain in the area is extremely rough and the mines nearby have been unable to deliver ore to the Eldorado mill.

Gunnar Mines, Ltd. boasting the largest open pit uranium ore mining operation in the world, has the third mill in the area but it has not so far done any custom milling.

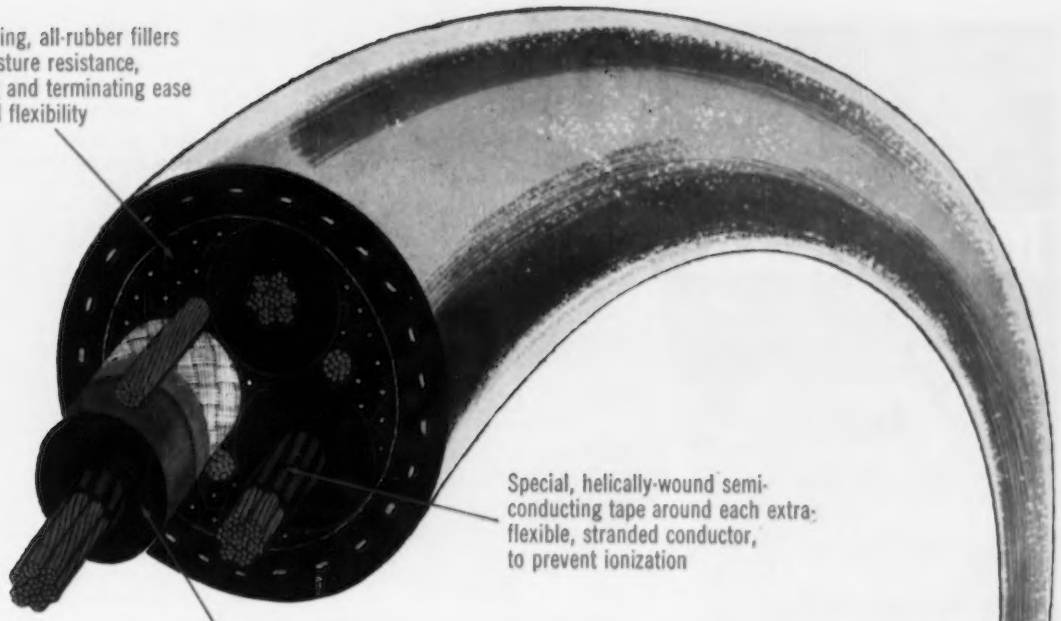
The new mill is using a sulphuric acid leaching process. The leaching plant is almost ready for operation.

## Idaho *(Continued)*

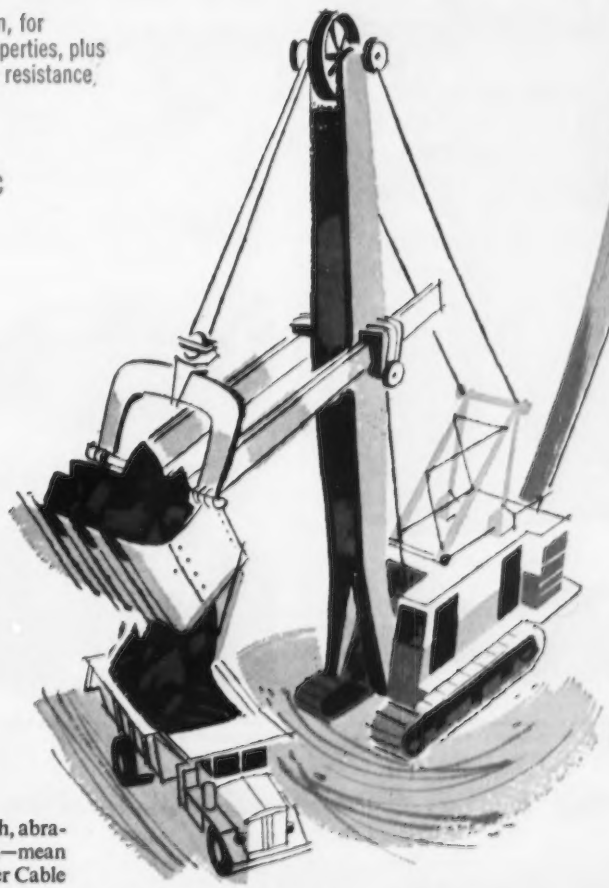
**Development work on the new 4000-ft level of the Silver Syndicate Inc. property adjoining the big Sunshine Mine in the silver belt of the Coeur d'Alene District has disclosed consistently higher values** in lead and silver than had been anticipated, according to general manager Norman M. Smith. Silver values in the first 130 ft of easterly drifting beneath the "70" stope have ranged from 15 to 40 oz per ton, as compared with about 10 oz on the 3840 level above and the lead content has been running 7 to 10%, against 6 to 7%. Ore width on the lower horizon is slightly narrower.

**Jack Waite Mining Co.'s new management in New York has retained the services of Wisser and Cox, San Francisco geological firm,** to make a complete, up-to-date report on the company's property on the Idaho-Montana border northeast of Wallace. The mine is operated by American Smelting & Refining under a 40-year contract which runs to 1974.

**Sidney Mining Co. has concluded an operating agreement with East Lemhi Mining Co.** providing for exploration and development of the latter's British Columbia lead-silver property, on the Adams Plateau, and has started a diamond drilling program to delineate the three ore shoots which have been exposed in shallow surface workings. Sidney will


Free-riding, all-rubber fillers for moisture resistance, splicing and terminating ease unusual flexibility
Special, helically-wound semi-conducting tape around each extra-flexible, stranded conductor, to prevent ionization
Butyl conductor insulation, for outstanding electrical properties, plus heat, moisture and ozone resistance
A combination of properties which permits operation with copper temperatures up to 85°C

# IT'S THE EXTRAS THAT MAKE THE DIFFERENCE IN ROEBLING SH-D PORTABLE POWER CABLE!



These *extra* features and others—such as the tough, abrasion- and weather-resistant Roeprene® Sheath—mean rugged, *full-power* Roebling SH-D Portable Power Cable really can stand the gaff.

If you saw this cable made, you'd know why it is so tough... and if you saw it made, you'd never specify anything else! For complete information, write Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, N. J.

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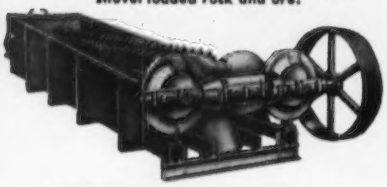
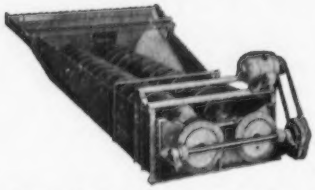
A pioneer in the development of many types of processing equipment, McLanahan has served domestic and foreign pits, mines and quarries for more than a century. Shown are a few illustrations of McLanahan equipment for crushing, washing, sizing and conveying all types of ore, rock, coal and other materials. Technical details and price information will be sent upon request.

All Steel Rockmaster Single Roll Crusher for primary or secondary work on shovel loaded rock and ore.

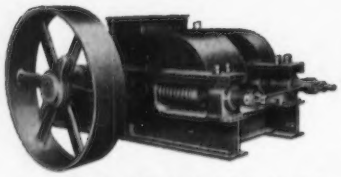
Heavy Duty Reciprocating Plate Feeder. Handles any materials from sand sizes to shovel loaded rock and ore.



Log Washer for removing tough clay and soft rock from various materials.

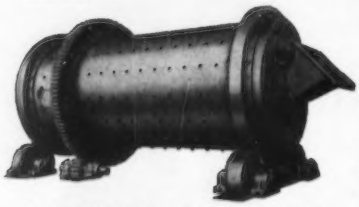


Double Screw Washer (with gear cover removed), for dewatering, classifying and removing waste from sand, limestone and other materials.



Heavy Duty Fabricated Steel Double Roll Crusher for secondary reduction of rock and ore.

Double duty combination Scrubber and Sizing Screen for large and small capacities.



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## Idaho *(Continued)*

advance the funds for the project and has agreed to build a mill when sufficient ore has been blocked out.

**Bunker Hill Co. of Kellogg has advised employees that no curtailment of operations or major lay-offs are contemplated in the foreseeable future,** despite the recent slump in lead and zinc prices.

"The company is basically sound and in a sufficiently strong position to weather this price crisis," president John D. Bradley and vice president Wallace G. Woolf said in a joint letter to employees.

They said they continued to "look confidently" to future growth of the company and are planning no cutback in the $15-million, five-year expansion program that is currently underway.

Bradley announced that recent development work in the company's Bunker Hill Mine had disclosed "a very promising lead-silver structure similar in grade and character to certain of the richer type orebodies mined in earlier years. Bradley said it would take some time to determine the full value of the new zone, but present evidence is strong enough to warrant an optimistic outlook.

Bradley also announced recently that the company is investigating fluorspar resources in central Idahos Lemhi and Custer Counties as a possible avenue for diversification of its mining activities.

In July the company's big lead smelter at Kellogg marked its 40th anniversary of production of lead and associated by-products. In that time it has produced about 2.5-million tons of lead, more than 330-million oz of silver, about 500,000 oz gold, as well as 220,000 tons of zinc, 35,000 tons of copper, and 1.5-million lb antimony. Plant capacity today is nearly triple the original rate of output due to continuous modernization and expansion which is still in progress. Built in 1916-1917 at a cost of about $15-million, the big smelter is now valued at more than $20-million.

**Lucky Friday Silver-Lead Mines Co. reported recently that its main orebody has been found** in place on the new 2450-ft level of its property east of Mullan. Where encountered by the crosscut from the shaft, the vein is 5 ft wide and favorably comparable in grade with upper levels. Drift work to open the ore on the new horizon is now in progress. Development of the 2600 level is expected to be the next major project. The main shaft has already been sunk to below 3100, with stations for working levels at 150-ft intervals.

**Below-sea-level exploration of the Mineral Mountain area in the silver belt between Wallace and Kellogg has been started** by Polaris Mining Co. under an operating agreement recently concluded with Mineral Mountain Mining & Milling Co. and Chester Mining Co. A new exploration crosscut will be run in a northwesterly direction into the Mineral Mountain area, as defined under a previous agreement between the three firms, from the west face of the 3000-ft level Chester lateral. Principal objective will be the Mineral Mountain No. 1 vein,

# how 75 ton BROWNHOIST combination crane will greatly increase GALVESTON port facilities

The latest type combination boat-unloading crane being engineered and built by Industrial Brownhoist in Bay City, Michigan will substantially improve facilities in the Port of Galveston's 1957 expansion program.

This big, fast-working Brownhoist crane loads or unloads bulk materials from ship-to-cars or cars-to-ship at the remarkable rate of 540 tons per hour! Equipped with 75 foot boom, on which travel both a hook and a Brownhoist-made, 80 cubic foot flush link-type bucket. The entire unit straddles three railroad car tracks located on the pier.

In addition to boat unloading equipment and material handling bridges, Industrial Brownhoist manufactures Diesel-Electric locomotive cranes from 25 to 90 tons, and railroad cranes up to 250 ton capacities. If your firm can profit from reliable, high-speed, high-capacity material-handling equipment, write for new general Catalog No. 562.

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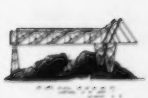
# BROWNHOIST

CLAMSHELL BUCKET

250 TON WRECKING CRANE


COAL-ORE BRIDGE

CAR DUMPER

LOCOMOTIVE CRANE

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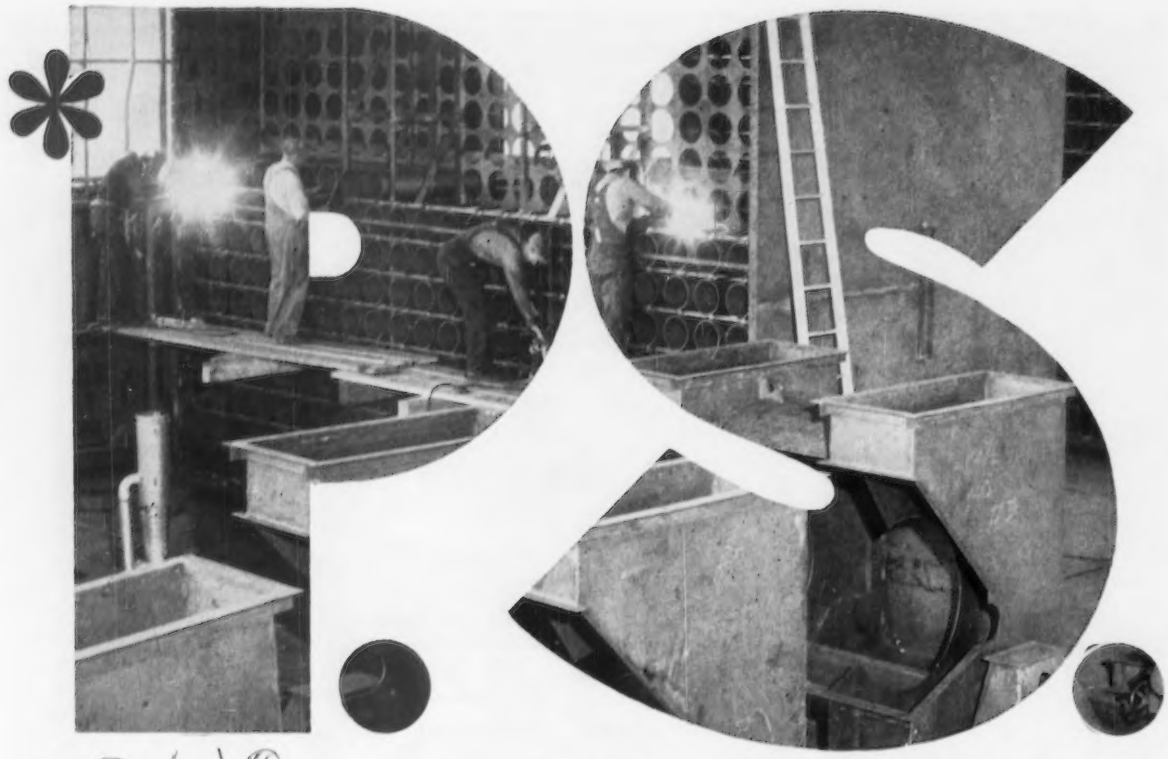


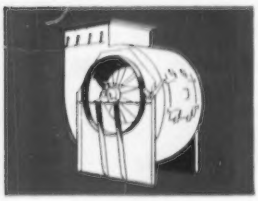
## *PROBLEM SOLVERS

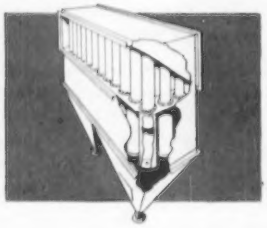
FLY ASH ARRESTOR'S research laboratory, engineering and manufacturing facilities are *totally set up* and especially experienced to provide a "dollar-saving" solution to the most perplexing dust collecting problem. Tell us about your conditions . . . what you want done!

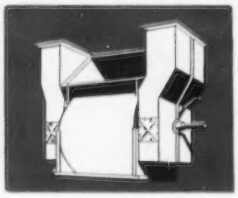
WHIRLEX *dust collecting efficiency begins with "tailored" planning.* Each dust collecting problem . . . whether nuisance elimination or process material recovery . . . gets special study and handling. FLY ASH ARRESTOR engineering solves each problem with a completely integrated, *shop-assembled* WHIRLEX Dust Collector Unit specifically designed and constructed for the job.

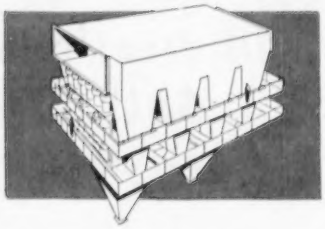
WHIRLEX *heavy-duty* industrial exhaust fans are available to handle any air moving problem. WHIRLEX *standard* forced and induced draft fans are available for boiler applications.

WHIRLEX equipment assures maximum efficiency right from the start . . . and continues to pay off with consistently low operating and maintenance costs.









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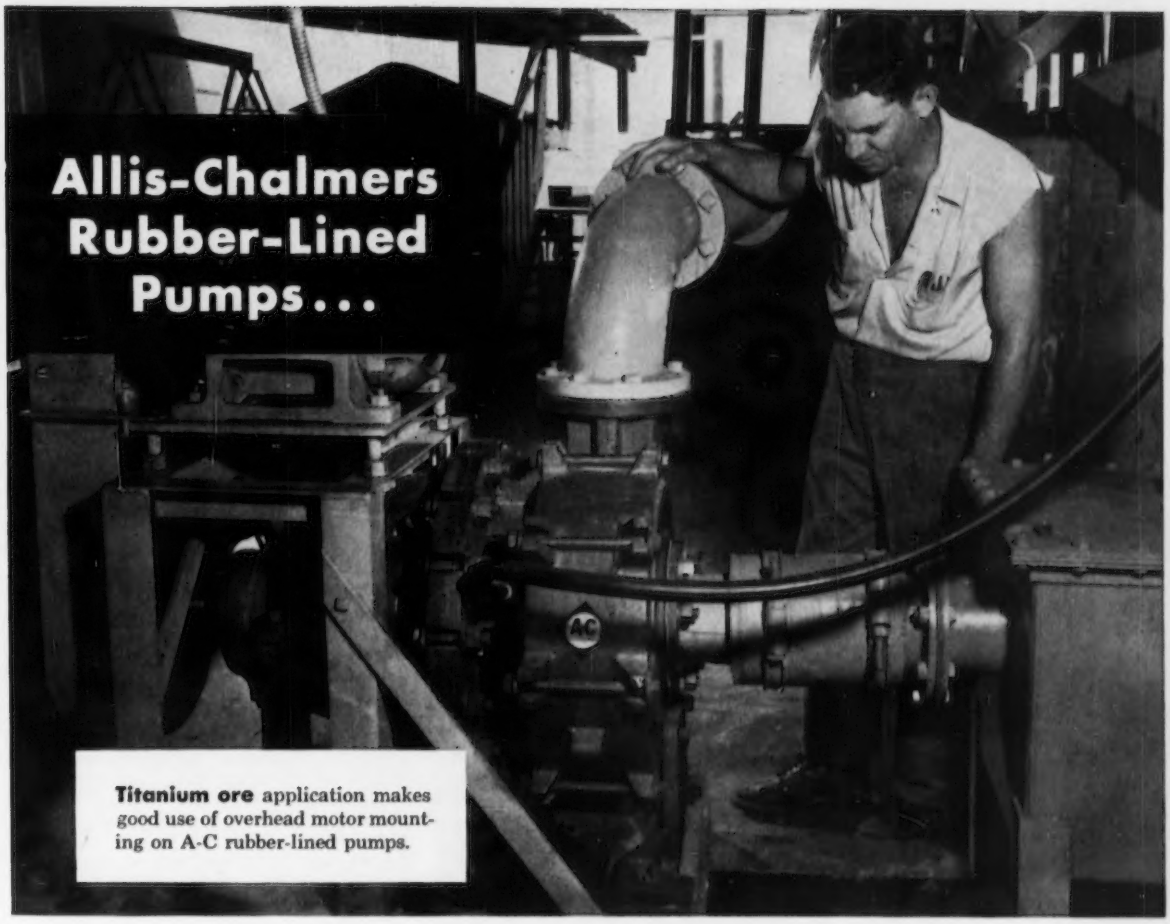


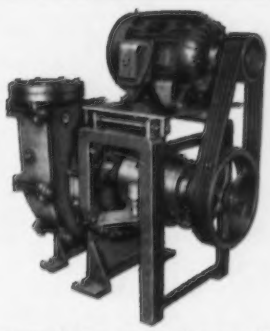

**Titanium ore** application makes good use of overhead motor mounting on A-C rubber-lined pumps.

# Resist abrasive wear

TEN to 50 times greater abrasive service life has been proven in Allis-Chalmers rubber-lined pumps than in expensive alloy pumps. Here's why:

- Special rubber compounds resist wear of even such abrasive slurries as taconite and silicon carbide.
- Casing liners are pressure molded to steel frames, combining the rigidity of steel with the resilience of rubber.
- Slotted bolting simplifies parting casing for inspection of impeller and liners.
- Extra heavy duty oil-lubricated bearings to overcome the thrust encountered in continuous demanding operation.

**Among the many features** available with A-C rubber-lined pumps is overhead motor base mounting. With this arrangement, water and muck can't reach vital motor parts. Contact your A-C district office, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.



**Complete pumping unit** is offered by Allis-Chalmers: includes pump, motor, *Texrope* drive and control.

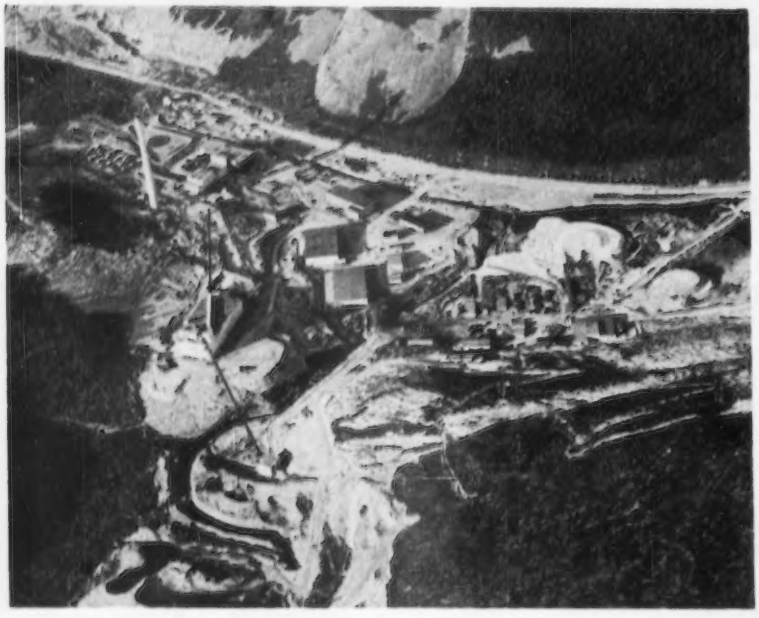
*Texrope* is an Allis-Chalmers trademark.

A-C ALLIS-CHALMERS

A-5401

# ALLIS-CHALMERS

**INTRODUCTION OF NEW METHODS** and equipment is enabling the newly independent nation of Malaya to maintain her position as producer of one-third of the Free World's tin. Metal is reclaimed by dredging, open cast, underground, hydraulics and "dulang washing." Ore handled by the various methods, like the monitor above right and palong sluice at left, ranges from 20- to 60% tin oxide. Pahang Consolidated Co. operates the underground mine in the State of Pahang via some 200 miles of drifting. Dulang washing, or panning, is done in the streams by women.



**1,000 EMPLOYEES** of Gaspe Copper Mines Ltd. normally keep mill output at 6,000 tpd. Labor disputes nearly halted production but officials expect complete recovery.

# Strikebound Gaspe Copper Plans Step-Up

COMPANY OFFICIALS predict at least 35 years of future productivity at the $48-million Gaspe Copper Mines Ltd., Murdochville, Gaspe County, Quebec.

For the past few months, Gaspe Copper Mines has been plagued with a strike. However, the firm has managed to revive operations on a limited scale. In mid-May the mill resumed restricted activities; the smelter started again in August. The mill rate is below capacity (3,000 tpd) but total rated capacity is 6,500 tpd.

Prior to present labor problems, maintaining mill and smelter production at 6,000 and 100 tpd, respectively, required a working force of 1,000 employees (85% of whom were native Gaspesians.) Smelter produces fire refined anodes.

Development drilling with Helman Silver Bullet airlegs (2⅝) machines and removal by track-mounted Eimco rocker shovels precedes actual copper ore extraction. Ore drilling and shoveling are performed by 3½ Gardner-Denver TM-350 drifters mounted on seven drill jumbos, and Model 803 Baldwin-Lima-Hamilton shovels with 2½-cu yd capacity buckets. Model K450 tunnel shovels with 1½ cu yd capacity buckets also remove ore fragments.

Joy shuttle cars (capacity-14 tons), Mack trucks, Model LRX (18 tons) and Kochring Dumptors, model 60 (9 tons) haul ore to Canadian National Railway for shipment to the Noranda, Que. refining center.

**ANACONDA** employee John Brankovec supervises lifting of clay sample from one of the many shafts being put down in Idaho's Latah County. Samples of the aluminum-bearing clays will be studied.

# HOW ST. PATRICK'S COPPER MINE MOVES 1⅓ MILLION TONS OF ROCK A YEAR

**ON ITS WAY OUT OF THIS MINE, a huge Caterpillar DW21 Wheel Tractor stops to have its picture taken—for here it is helping to make mining history.**

At St. Patrick's Mine near the village of Avoca in County Wicklow, Ireland, four 30-ton units are operating *underground*—first machines of their size ever to do so, anywhere in the world.

The machines are CAT* DW21s (Series C). They're hauling earth and rock from inside the mine tunnel to an outside dumping area. The tunnel is 17 ft. high, 16 ft. wide, and when it is finished it will run 8,000 ft. at an 11% slope. In and out of this tunnel roll the mighty DW21s, each hauling an Athey PR21 rubber-tired rear dump trailer with 34-ton load.

When the haulage-way is completed, St. Patrick's will work three ore bodies—which are at different levels—in one 20-year program. 1⅓ million tons of rock will come out of the ground here each year, on the fast-moving wheels of St. Patrick's 300 HP (maximum output) Caterpillar DW21 Wheel Tractors.

How are the DW21s doing on this history-making assignment? "They are easy to handle," reports transport foreman Phelim Doyle. "I would like to have ten more." Operator Thomas Doyle agrees: "It's easy to steer, and it has plenty of power."

Your Caterpillar Dealer will give you complete information on this remarkable unit. For example, special exhaust scrubbers are available for the DW21's engine for underground work. Ask him about its performance on any kind of stripping or hauling job. Call on him, too, for expert service—and for replacement parts you can trust.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

**CATERPILLAR***

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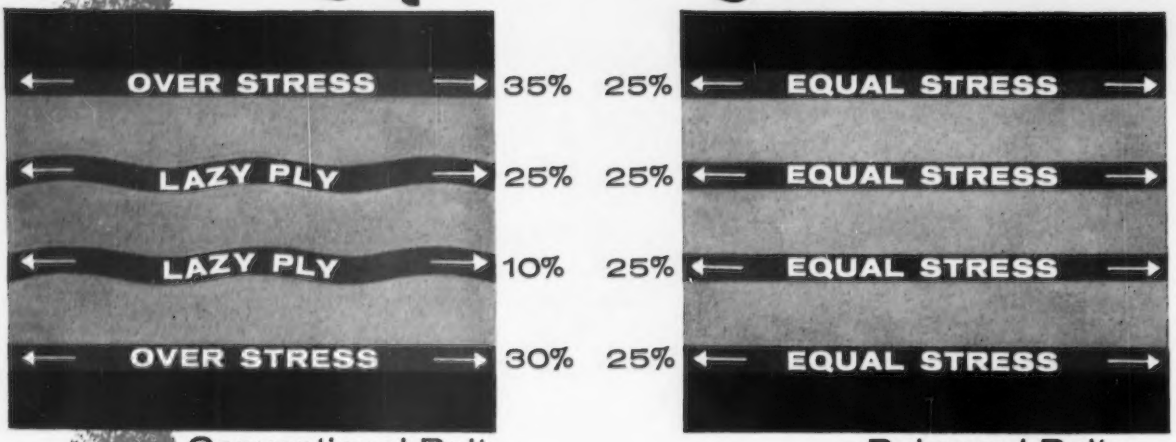
**ONE GOAL: To concentrate our capabilities, resources and experience on the design, manufacture, distribution and service of job-tested heavy equipment.**

# Increase Your Production and Mine Safety

# Are you paying for "lazy plies" in your belts?




Conventional Belt Construction

Balanced Belt Construction

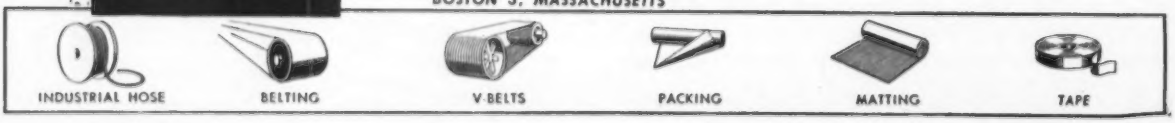
# Balanced Belt Construction

## Equalizes stress – prolongs belt life

BBC – Balanced Belt Construction – equalizes ply stress . . . *every* ply pulls its share of the load. You get trouble-free service . . . greater economy. BBC is a result of two remarkable BOSTON developments: *Electro-Tensile Control* and *Rotocure*. Electro-Tensile Control electronically controls stress in the plies during manufacture. Rotocure, the only continuous method of vulcanization, assures complete uniformity from end to end.

You cannot afford to underestimate the value and importance of Balanced Belt Construction. Your BOSTON man is ready to demonstrate how BBC prolongs belt life, minimizes downtime, saves you money!

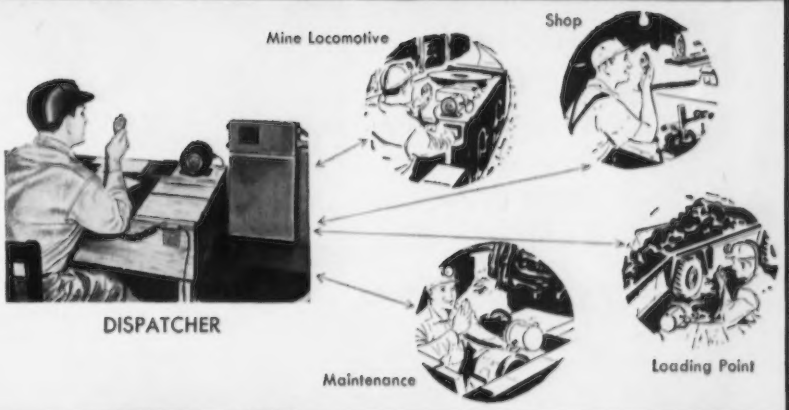
**BOSTON** BOSTON WOVEN HOSE & RUBBER CO. BOSTON 3, MASSACHUSETTS



# Increase Your Production and Mine Safety with these M·S·A Communication Systems

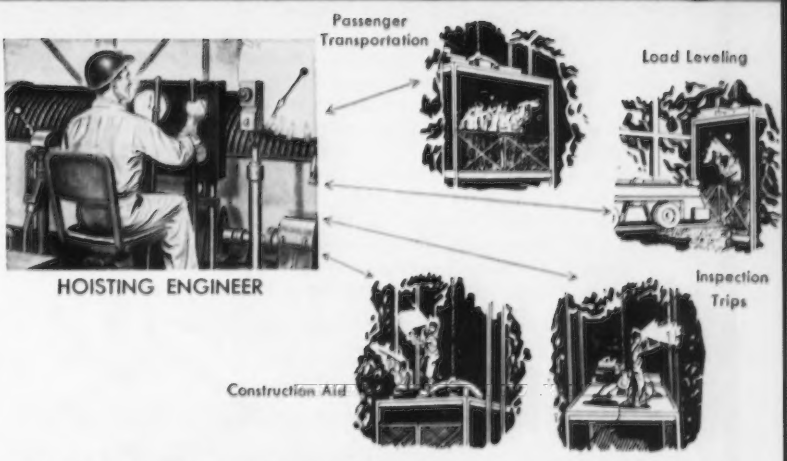
# MinePhone

The M.S.A. MinePhone is eliminating communication delays in many modern mines everywhere. This clear, instant two-way voice communication system coordinates the wide variety of operations vital to peak production. Haulage moves faster because dispatcher and motormen are constantly in touch, even while trips are in motion. Shop and maintenance personnel are always "on call" to keep mining equipment in operation. Because messages are relayed instantly, on an open-line hook up, the MinePhone brings an added measure of safety to all operations. Write for details.




# HoistPhone

The M.S.A. HoistPhone provides continuous, dependable and efficient voice communication between hoisting engineer and cage, at any level, and when in motion. The system is invaluable in emergencies, yet designed for day-in-day-out service. Ideal for passenger travel, load leveling, inspection trips, and construction work, the HoistPhone requires no special training; utilizes existing wiring. Write for complete details.

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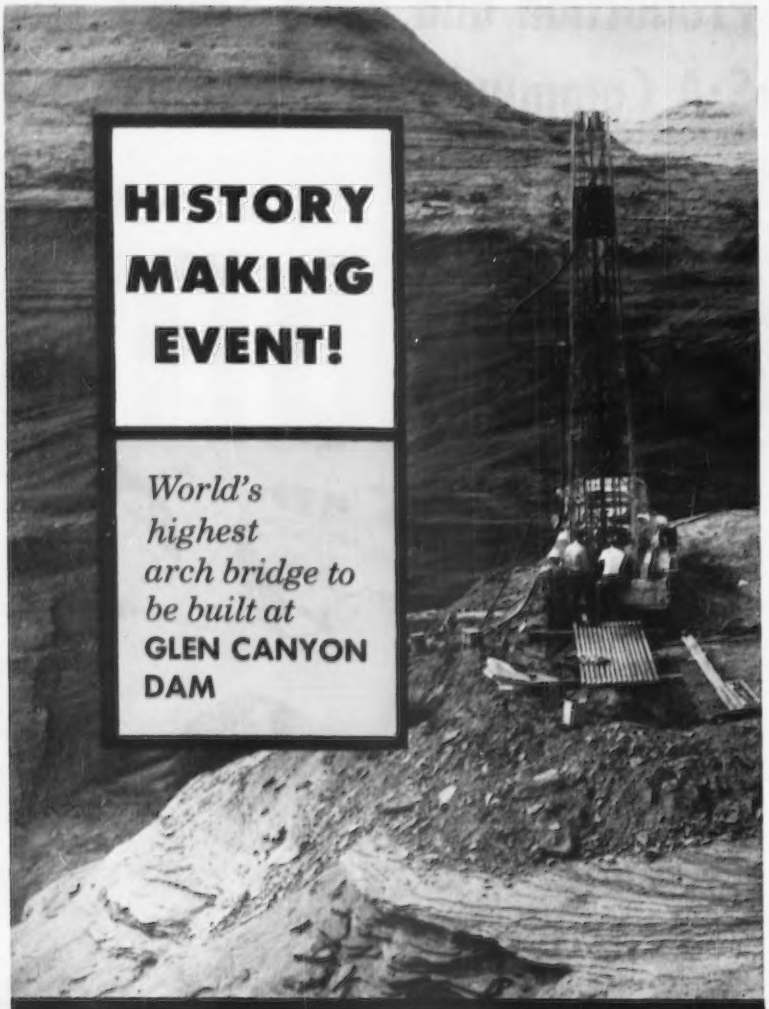


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CHRISTENSEN DIAMOND PRODUCTS

1937 SOUTH 2nd WEST SALT LAKE CITY, UTAH

## Idaho *(Continued)*

estimated to lie about 1500 ft away. The new work will gain about 1700 ft of depth below previous workings, put in by Polaris from the old Polaris shaft under an agreement negotiated in 1946.

**As of Aug. 1 the new Bonanza vein at the Dayrock property of Day Mines Inc. north of Wallace had been opened by drift for a length of 340 ft** and by raise for 70 ft, and both faces were still in ore. The new orebody, initially disclosed by diamind drilling early this year in a previously unexplored sector of the mine, averages 4.6 ft in width and carries values averaging 20.7% lead and 6.8 oz of silver per ton.

**Low lead and zinc prices, coupled with the fire loss of milling facilities and a lack of developed ore, has forced American Smelting & Refining Co. to curtail operations** at its old Morning Mine at Mullan, but results of development work on the Noonday vein continue to be very encouraging and the property is expected to rejoin the ranks of economic producers when the current slump in metal prices runs its course, according to J. C. Kieffer, general manager of the firms northwest mining department. The new Noonday ore shoot has already been drifted out on the 1250 level and a raise to 1050 has been completed, in ore all the way. Diamond drilling has picked up the vein on 800, and crosscuts on this horizon, the 1050 and the 1450 levels are currently under way.

**Bradley Mining Co's Ima Mine at Patterson, in Lemhi County, one of the nation's leading tungsten producers in recent years, was closed down as of June 30** as a result of the failure by Congress to appropriate additional funds for the Government's tungsten purchase program. About 50 men were laid off, leaving only a skeleton crew of 8 men for maintenance and administrative work. The mine had been operating on a curtailed basis from mid-May. At that time 48 employees were laid off.

**Triumph Mining Co. closed down its Triumph lead-silver-zinc mine** in the Warm Springs District of Blaine County on July 12, attributing the action to the price slump in lead and zinc. It had been operating with about a 50% crew since March.

**Western Fluorite Mining Co. of Warren, Ark., has developed a small deposit of high-grade uranium ore** on its leased Little Bill property in Custer County, near Stanley, and expects to make Idaho's first shipment of uranium ore in the near future. The deposit, which occurs along a vein structure, contains an estimated 300 tons, with values in autunite and uranophane ranging from 1.26 to 3.02% uranium oxide. Other ore disclosures along the vein are now being explored and developed.

**Plans for development and utilization of Latah County's vast clay deposits moved into a more advanced stage** recently with the arrival of shaft crews at the Anaconda Co.'s optioned holding near Deary

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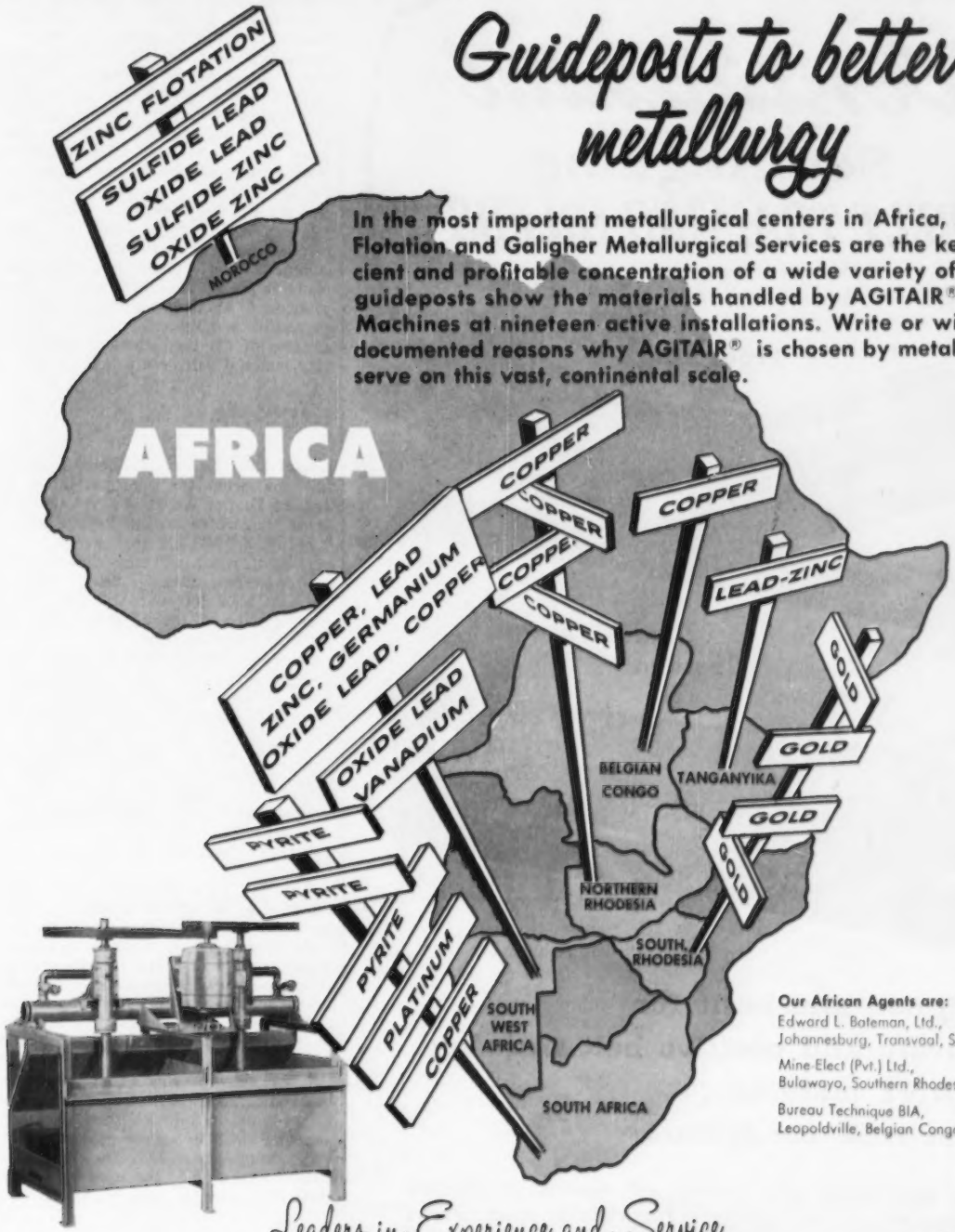
**In the most important metallurgical centers in Africa, AGITAIR® Flotation and Galigher Metallurgical Services are the keys to efficient and profitable concentration of a wide variety of ores. The guideposts show the materials handled by AGITAIR® Flotation Machines at nineteen active installations. Write or wire for the documented reasons why AGITAIR® is chosen by metallurgists to serve on this vast, continental scale.**

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### Idaho *(Continued)*

and the announcement that the J. R. Simplot Co. of Boise will begin construction of a clay processing plant at Bovill next June. The 12-party Anaconda exploration crew will spend the next six months sinking a dozen or more shafts into the clay beds to permit more detailed analysis of the material which the company expects to use, after upgrading through a company-developed process, for raw material at its aluminum reduction plant at Columbia Falls, Mont.

The Simplot firm, which has been investigating clay and silica deposits for commercial uses other than aluminum, plans to put up a pilot processing plant at a cost of about $1-million. If it proves successful, a multi-million dollar facility capable of handling about 1000 tpd of clay material will be erected.

## INDIANA

**Inland Steel Co. has announced that it has contracted for construction at its Indiana Harbor Works of a new sintering plant** designed to expand its ironmaking capacity by 300,000 tons a year. The new plant, which will treat fine particles of iron-bearing materials before they are fed into blast furnaces, will have twice the capacity of the company's present sintering facilities.

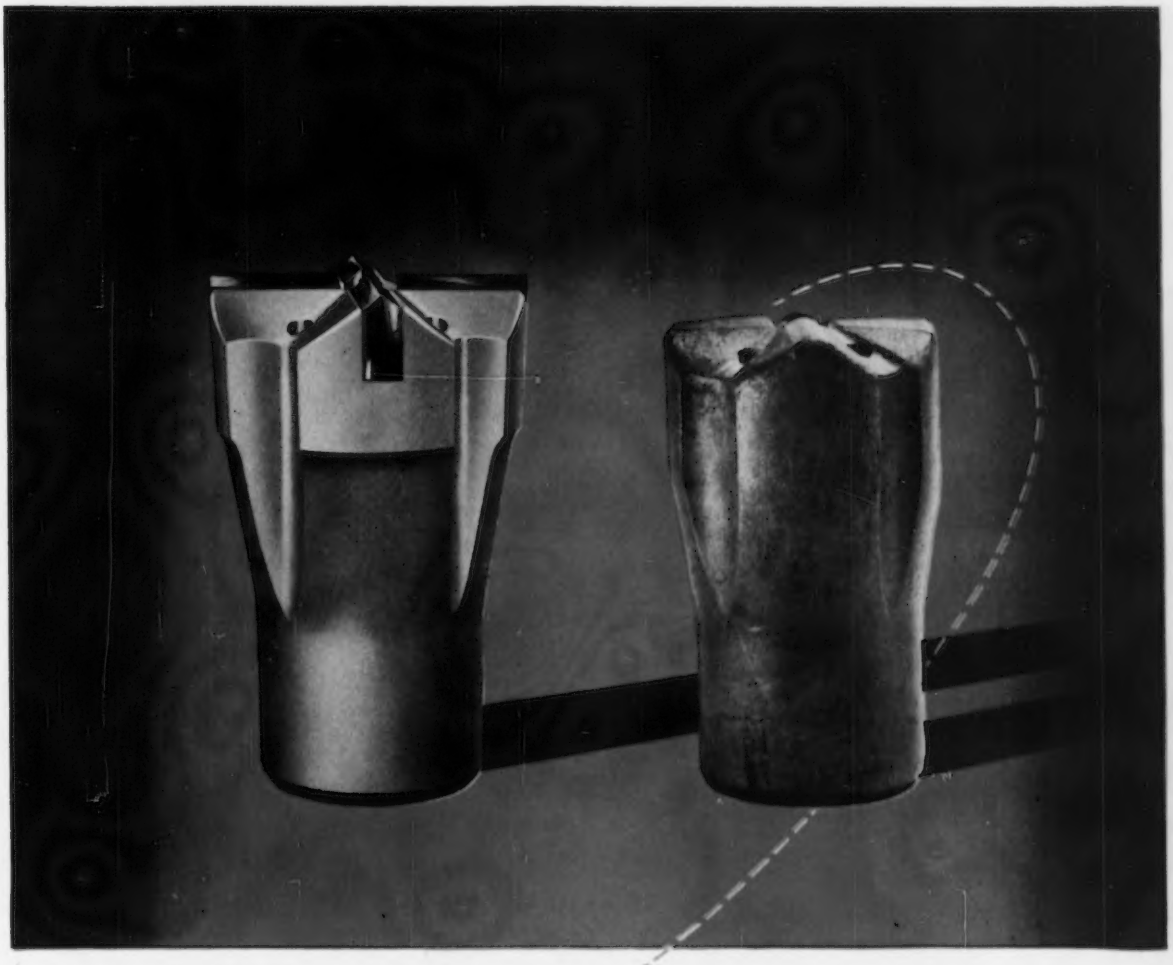
In a sintering plant fine particles of iron ore, flue dust rich in iron, and scale collected from steel rolling processes are fused into large clinker-like pieces. When fed into the top of a 100-ft high blast furnace stack with iron ore and other materials of the ironmaking process, the sinter creates what iron masters call "voids" in the mass of material, allowing better circulation of hot gases by which the ore is reduced to iron.

The new sintering plant will supply material to six of the company's eight blast furnaces. The pig iron from the eight blast furnaces, which have a combined capacity of 3,011,200 tons a year, is combined with scrap steel in open hearth furnaces which refine it into steel.

The construction contract has been let to the Dwight-Lloyd Division of the McDowell Co., one of the major steel mill engineering firms which specializes in building such plants and in the fabrication and erection of such materials handling facilities as ore bridges. Plant will occupy about 12 acres of a new 20-acre extension to the Inland property created by filling in Lake Michigan.

## MINNESOTA

**Oliver Iron Mining Division's new ore sizing plant at Virginia, consisting of eight screening units, an additon to the crushing plant at the Rouchleau mine, is in full production.** The plant can handle 33,000 tpd ore. Its chief function is to improve the structure of direct shipping ores by separating the fines (under ½") from the coarse. Direct shipping ores from the Rouchleau group



# THIS JOY BIT DRILLED 1000 *extra feet of hole*

**YOU'LL FIND YOUR BIT SIZE IN THIS CHART**

| SHOULDER DRIVE | BOTTOM DRIVE | TAPER SOCKET |
|---|---|---|
| 1½" | 2½" | 1¼" |
| 1¾" | 2¾" | 1⅜" |
| 1¾" | 3" | 1½" |
| 1⅞" | 3¼" | 1⅝" |
| 2" | 3½" | 1¼" |
| 2⅛" | 4" | |
| 2¼" | 4½" | |
| 2⅜" | 5" | |
| 2½" | 5½" | |
| 2¾" | 6" | |
| 3" | | |
| 3½" | | |
| 4" | | |
| 4½" | | |

NOTE: Orange shade indicates x-type.
Black shade indicates 6 point rose design.
Others are cross type.

The real test of any tungsten carbide bit is—*how far does it drill?* The pictures above show a Joy bit before and after it drilled over 1900 feet of hole.

On a New England dam job, all other tungsten carbide bits had averaged 950 feet. Joy bits doubled this footage . . . averaged 1900 feet . . . gave the contractor a 2 to 1 advantage. (Particulars on request.)

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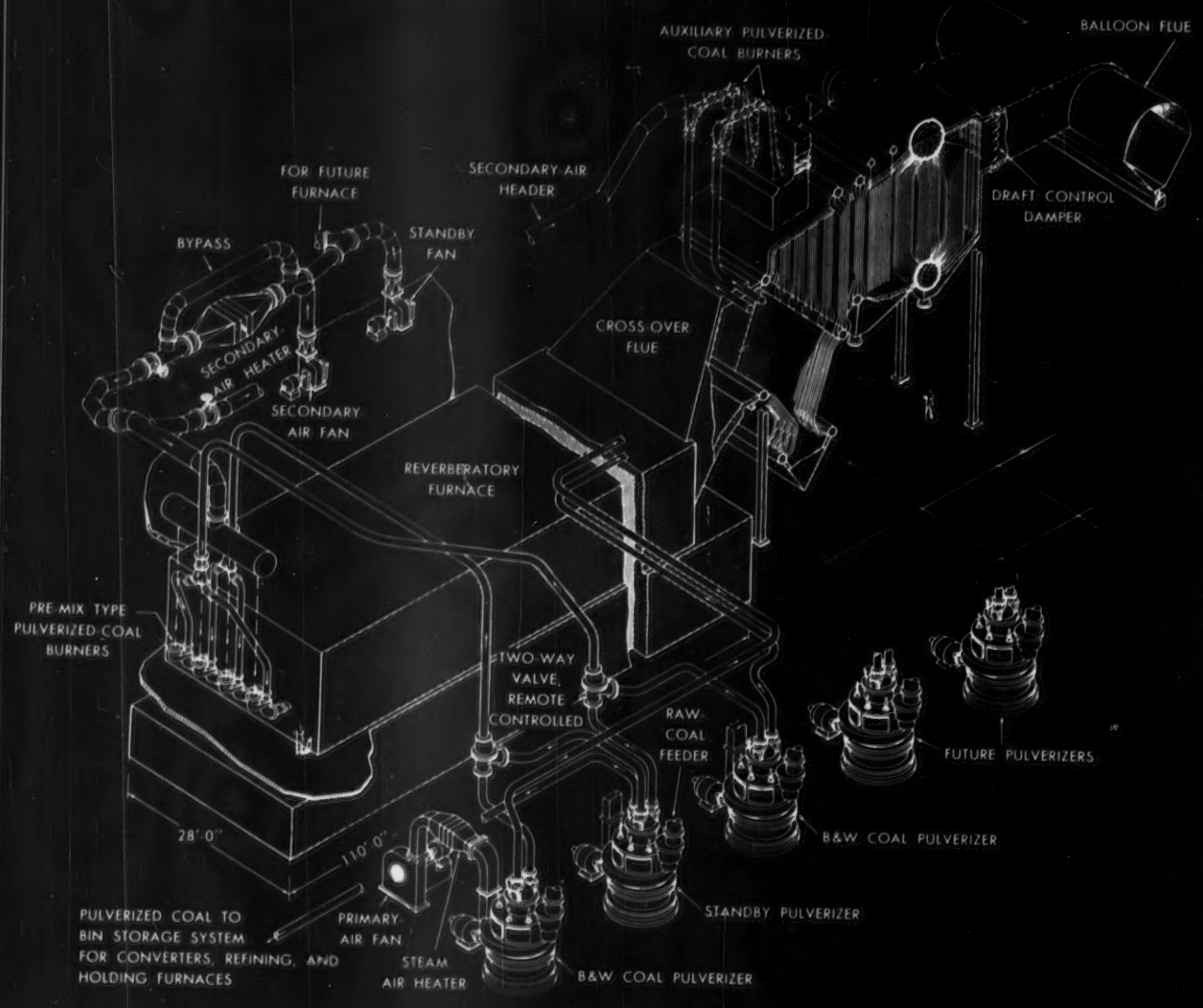
# How to Cut Processing




The White Pine Copper Company uses B&W coal-firing and waste-heat recovery system with B&W Single-Pass Boiler handling waste gases from the reverberatory furnace. B&W supplied all equipment shown with the exception of the reverberatory furnace and flues.

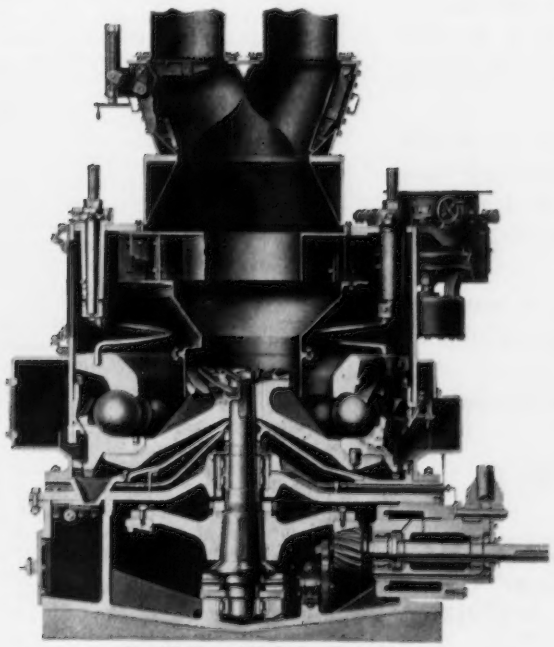
# Costs in Metallurgical Plants

## B&W Pulverized-Coal Firing Systems and Heat Recovery Units Help Do the Job

The White Pine Copper Company's fully integrated mine, mill and smelter in northern Michigan, started up in 1955, is one of the most advanced plants of its kind.

B&W had the responsibility of furnishing the complete raw coal handling, coal pulverizing and firing systems and the waste heat recovery equipment for this smelter.

The firing equipment is arranged with ample standby capacity to provide uninterrupted operation of the reverberatory furnace. During regular maintenance shut-downs of the furnace, continuous steam generation can be maintained by firing the boiler with the auxiliary coal burners.



B&W Type EL Pulverizer

Modern B&W boiler design permits uninterrupted furnace operation with a single boiler, eliminating the problems of a two-boiler arrangement with its costly cross-over flue design and refractory maintenance.

The B&W Single-Pass Boiler, under natural draft, easily handles dust-laden, high-temperature, corrosive gases from the reverberatory furnace. B&W's automatic soot-blowing system keeps the boiler clean and practically eliminates hand lancing.

B&W Direct-Firing and Circulating Pulverized-Coal systems are widely used for special firing applications of metallurgical furnaces. Higher production and lower operating costs can be attained through pulverized-coal firing. B&W's broad research, engineering, and production experience are available to solve your problems in metallurgical furnace-firing and waste-heat recuperation. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

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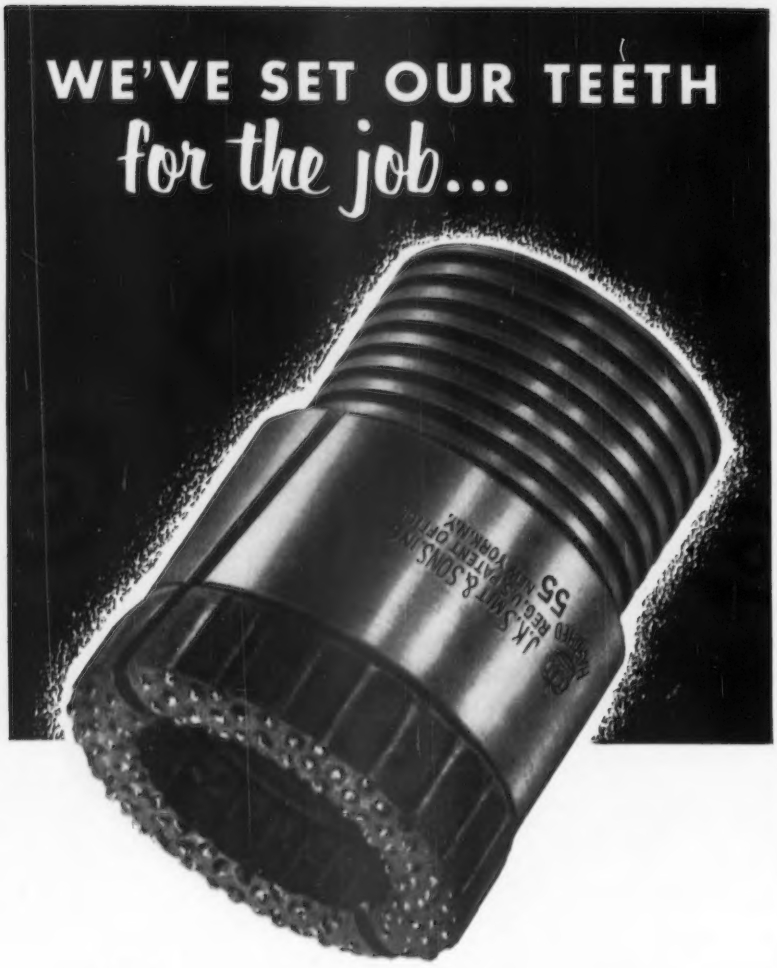
BABCOCK & WILCOX

BOILER DIVISION




Whether its coarse, fine grain, solid or broken formation EVERY diamond drill bit designed by J. K. Smit has behind it, hundreds of miles of actual field drilling tests.

EVERY diamond is of uniform size, shape and structure throughout; hand picked from thousands with a skill born of 68 years in this highly specialized business.

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HOME OFFICE AND PLANT
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## Minnesota *(Continued)*

of mines will be handled at the plant.

**New washing plant at the Webb mine of Snyder Mining Co., work on which was pushed during the winter of 1956-1957, is in operation.** The ore is crushed and screened in the pit before it is brought to the plant. Plant has a capacity of 1000 tons of crude ore per 8-hour shift.

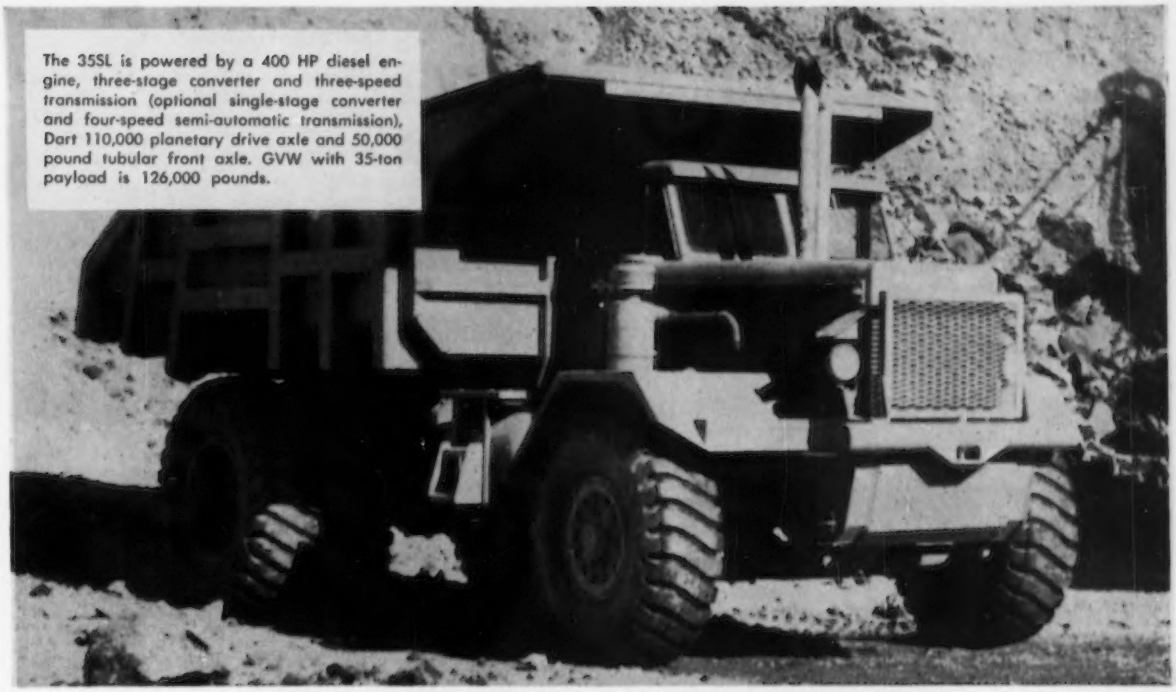
**Report of the Lake Superior Iron Ore Association shows that, in 1956, 28,200,991 tons of beneficiated ore was shipped,** or 36.52% of the 77,229,853 tons shipped from the U.S. portion of the Lake Superior area. In 1920, only 12.5% of Minnesota produced ore was concentrated; in 1930, 18.2%; in 1940, 18.8% and in 1950, 30.5%. With concentration plants now being built at Michigan mines, in addition to the taconite plans and lean ore beneficiation plants being constructed in Minnesota, the percentage of beneficiated ore may be expected to continue rising yearly.

**New officers of the Minerals Beneficiation Sub-section of the Minnesota AIME for the 1957-1958** year are: Chelsea R. Phillips, Hibbing, engineering and sales representative in the Lake Superior area for the Hewitt-Robins Co., chairman; Leon D. Keller, Virginia, district manager for the Dorr-Oliver Corp., vice-chairman; and Fred H. Bunge, Hibbing, supervisor of research for the M. A. Hanna Co., secretary-treasurer. Outgoing chairman is Richard W. Livingston, research engineer with the Jones & Laughlin Steel Corp. Minnesota Ore Division.

**Changes and promotions announced by the Meriden Iron Co.,** of which Wallace F. Ferris, Minneapolis, is president, are: C. W. Aronson, Hibbing, promoted from manager to vice-president; James R. Stewart, Hibbing, from chief engineer to manager; and Peter F. Torreano, Bessemer, Michigan, superintendent at the Peterson mine on the Gogebic range for Pickands, Mather & Co., has become chief engineer Changes are effective as of July 1, 1957 Meriden Iron Co represents the fee interests for the Bennett & Longyear group; Kearsarge Land Co.; Keewatin Land Co.; Mississippi Land Co. and the Sargent Land Co. Among the better known mines included in Meriden Iron Company's list are the Hawkins, Bennett and Longyear.

**Erie Mining Co.'s taconite plant at Aurora is more than 80% complete.** The harbor and 73-mile railroad are practically finished and, early in 1958, the plant will be producing high grade pellets. In full operation it will treat over 20-million tons of taconite a year, and will require 90,000 gallons of water per minute, or about 26 times as much as the Morton mine underground operation—one of the Mesabi Range "wet ones"—pumped at that time. Erie has over 900 employes at present and the force is being steadily increased to an ultimate 3000, most of whom will need special training.

**Oliver Iron Mining Division has an-**



The 35SL is powered by a 400 HP diesel engine, three-stage converter and three-speed transmission (optional single-stage converter and four-speed semi-automatic transmission), Dart 110,000 planetary drive axle and 50,000 pound tubular front axle. GVW with 35-ton payload is 126,000 pounds.

## WHAT THEY ARE SAYING ABOUT THE

# DART 35SL

## AFTER THE FIRST YEAR

**SUPERINTENDENTS:** *"Costs are down . . . Hauls a big load . . . And on two axles, highly manueverable . . . Lots of power . . . Less tire wear."*

**MASTER MECHANICS:** *"Rugged construction . . . It can take it . . . Less parts to maintain . . . Easy to work on."*

**DRIVERS:** *"Easy to steer . . . Very stable . . . Excellent visibility . . . Quick spotting under shovel."*

Dart 25SL powered by a 300 to 335 HP diesel engine, three-stage torque converter and four-speed transmission (optional single-stage converter and four-speed semi-automatic transmission), Dart 100,000 pound planetary drive axle and 25,000 pound tubular front axle. GVW with 25-ton payload is 97,000 pounds.

Dart 50T powered by a 400 HP diesel engine, three-stage converter and three-speed transmission (optional single-stage converter and four-speed semi-automatic transmission), Dart tandem planetary rear axles of 100,000 pounds capacity each, and front axle of 35,000 pounds capacity. GVW with 50-ton payload is 180,000 pounds.

## *POWER for the Climb—SPEED for the Haul Road*

HEAVY DUTY TRUCKS EXCLUSIVELY SINCE 1903

DART TONNAGE ENGINEERED TRUCKS

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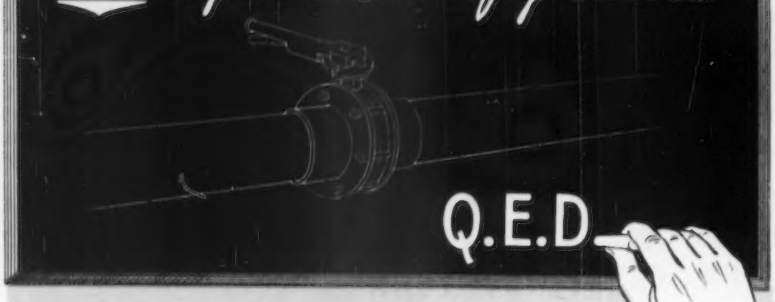
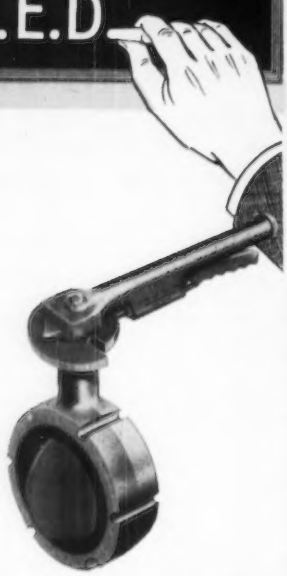
# Lesson in Plant Economy

**PROBLEM:** *To reduce valve maintenance costs and prevent excessive shut-down time when replacing seats and discs*

**SOLUTION:**
*Use Keystone Butterfly Valves*



Q.E.D.



**KEYSTONE Standard Valve with lever handle. Can be supplied with gear, electric, pneumatic or hydraulic operator.**

**KEYSTONE Valves** reduce maintenance costs two ways: (1) By giving longer service and (2) Through simplicity of design. Any part of the valve . . . seat, disc, stem or handle . . . can be replaced in a few minutes, using regular hand tools. The valve is removed from the line by loosening a few bolts, and removing half of them. Even in the largest size . . . 20" . . . only twenty bolts need be loosened. The entire valve lifts easily from the line, and is replaced just as easily. The resilient seat seals between the flanges. No gaskets are necessary. Shutdown time is negligible.

Furnished in sizes 1" through 20", for use with 150 p.s.i. standard ASA raised face or **KEYSTONE** flanges. Valves 24" through 48" rated 125 p.s.i. These valves are designed for liquids, dry materials or slurries, pressure or vacuum service.

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## Minnesota *(Continued)*

**nounced the appointment of three new district industrial engineers** for its three Minnesota operating districts: John R. Aho, Virginia, who has been with Oliver since 1942 and has served as mining engineer and as mining captain at the Pioneer and Leonidas mines, for the Virginia-Eveleth district; John B. Sundquist, Hibbing, who began in 1936, and was operating budget engineer before receiving his new appointment, for the Hibbing-Chisholm district; and Paul R. Wallen, Grand Rapids, who started in 1953 as a geological engineer and later became mining engineer, pit foreman and operating budget engineer, for the Canisteo district where he had worked.

**Jones & Laughlin Steel Corp.** Minnesota Ore Division is preparing its Lind-Greenway property near Grand Rapids for probable production in 1958.

**Loadings of iron ore for the second week of July were 3,385,426 tons,** largest since the third week of August 1953, when 3,453,663 tons passed through the docks. Cumulative shipments on July 22 amounted to 38,460,118 tons, compared with 31,910,340 tons in 1956.

**Pacific Isle Mining Co. is stripping and mining ore at the old Iroquois mine pit** in Mountain Iron. The mine is being worked in conjunction with the Wacootah pit which Pacific Isle has operated since 1952. It shipped 153,397 tons in 1956. The Iroquois has been idle since 1914.

## MICHIGAN

**Wolverine Tube Division of Calumet & Hecla, Inc., has announced that commercial extrusion of molybdenum tubing has been accomplished** in cooperation with Climax Molybdenum Co. Climax provided the molybdenum billets as well as important information concerning the metal. The product is expected to be used in nuclear power plants, jet engines, rockets and missiles because it is stronger than any other known metallic material at temperatures above 1700 deg F. It is also resistant to corrosion by liquid metals. The tubing, less than 1 in. outside diameter, and about 0.1 in. thick, comes in 3 ft to 6 ft lengths. It has a tensile strength of 70,000 to 100,000 psi, and a yield strength of 60,000 to 90,000 lb psi.

**Buck mine of Pickands, Mather & Co., with 258 employes, won first place in national safety competition** for underground metal mines for 1956. It had 501,759 man-hours of work with no lost time accident. W. E. Seppanen is general superintendent for PM&C on the Menominee range where the Buck mine is located. The Buck group shipped 422,596 tons in 1956.

**Pickands, Mather & Co. is shipping from the Buck group of mines through the Berkshire central hoisting shaft and from stock-pile** at the Fortune Lake open pit where production was completed last



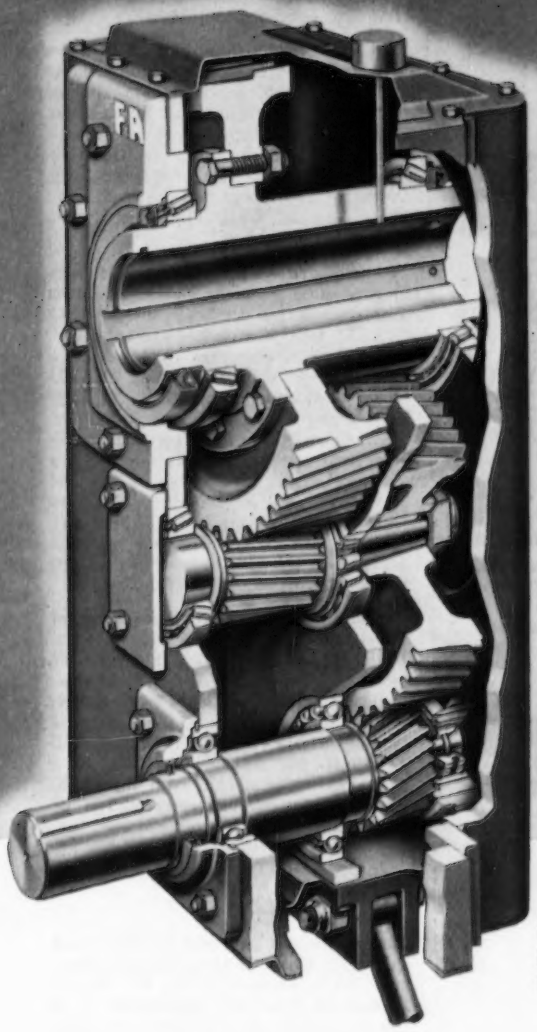

VICTAULIC®

Michigan *(Continued)*

# *New*...LARGER...ALL-STEEL!

# -the FALK 315J Shaft Mounted Drive

- **for higher horsepower**
- **for lower output speeds**



THE NEW 315J...
FROM 2 HP AT 5 RPM
TO 50 HP AT 359 RPM

## Check These Features

*New* — 3-wall, one-piece housing provides double the ability of cast iron to withstand external impact or shock loads.

*New* — ratio range—5:1, 14:1 or 25:1. Higher ratio range makes possible lower output speeds...smaller sheaves...standard, rather than slow-speed, motor.

*New* — ease of maintenance. All revolving elements can be easily replaced in the field, on the jobsite! Inspection covers permit quick inspection of gears and bearings. Dipstick provides quick check on lubricant.

*New* — longer center distance between shafts allows use of larger sheave on input shaft. Unit may be mounted with input shaft next to driven machine, and with motor mounted directly under driven shaft.

**PROMPT DELIVERY**

Standard units are available for off-the-shelf shipment from factory, warehouse or distributor stock.

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## The new Falk 315J also gives you these famous Falk advantages—

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- Through-hollow shaft design for easy installation, with internal groove to permit use of bearing puller when dismounting unit. Hollow shaft also permits use of unit on through-shaft applications.
- Tie rod fastened to steel housing by steel bracket with bolt in double shear. Shock load on tie rod will not damage housing.

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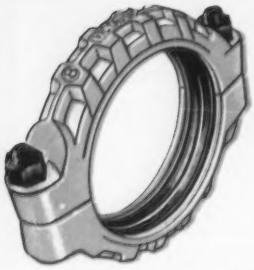

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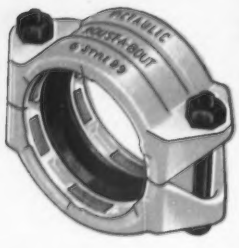
Simple, fast, reliable. *Styles 77, 77-D*, for standard uses with steel or spiral pipe, — *Style 75* for light duty. Other styles for cast iron, plastic and other pipes. Sizes ¾" to 60".




**ROUST-A-BOUT COUPLINGS**
For plain or beveled end pipe *Style 99*. Simple, quick, and strong. Best engineered and most useful plain end coupling made — takes a real "bull-dog" grip on the pipe. Sizes 2" to 12".

**VICTAULIC SNAP-JOINTS**
The new, boltless, speed coupling, *Style 78*. Hinged into one assembly for fast piping hook-up or disassembly. Hand locks for savings in time and money. Ideal for portable lines. Sizes 1" to 8".

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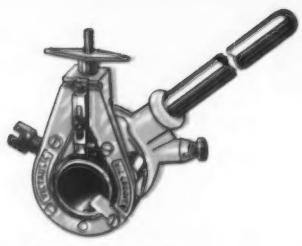

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Time saving, on-the-job grooving tools. Light weight, easy to handle — operate manually or from any power drive. Sizes ¾" to 8".

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**VICTAULIC COMPANY OF AMERICA**
**P. O. BOX 509 • Elizabeth, N. J.**


### Michigan *(Continued)*

fall. It is also producing from the Cornell pit at Iron Mountain which was taken over from the Globe Co. in early 1957. North Range Mining Co. has begun processing low grade ore from the Fortune Lake pit at its Book mine washing plant. The ore was hauled by truck from the mine waste pile during January, February and March.

**Minerals beneficiation Sub-section of the Michigan AIME, at a meeting held at Michigan Tech. in Houghton, elected officers** for the coming year: M. E. Volin, Houghton, Michigan Bureau of Minerals Research, chairman; H. F. Ameen, Negaunee, Jones & Laughlin Steel Corp, research laboratory, vice-chairman; and Ross Gamble, White Pine Copper Co., secretary-treasurer.

**As estimated by Harry J. Hardenberg, deputy state geologist, Michigan's iron ore reserves for 1957** amount to 154,208,852 tons with a valuation of $93,815,000. This compares to 152,259,276 tons in 1956 with a valuation of $90,716,500. Marquette Range has the largest reserve at 64,463,706 tons; the Menominee Range has less than 1-million tons under the Marquette. The Gogebic Range has 26,209,049 tons and is the only one of the three ranges to show a decline over 1956.

White Pine Copper Co. with valuation placed at $11-million, was the largest of any Michigan copper property.

**Annual meeting of the Association of American State Geologists,** met at Houghton Aug. 19-24. The schedule included field trips to the Keweenaw peninsula, the Marquette Iron Range, White Pine copper mine, the geological facilities at Michigan Tech. College, and a visit to Isle Royale. On Aug. 20 a joint meeting was held with the U. S. Bureau of Mines and representatives of the Atomic Energy Commission.

## MONTANA

**Merger Mines Corp., and St. Paul Lead Co., both Coeur d'Alene District firms, have let a contract to L. W. Rubier & Sons of Troy, for construction of a 100-ton mill** at the old Snowshoe lead-silver-gold mine in Lincoln County, Mont., south of Libby. The plant is expected to be ready for operation by Sept. 1. Reactivation of the old producer, which yielded more than $1-million in smelter returns to early-day operators, has been under way since last year.

## NEVADA

**The mammoth gold dredging and milling operation at Round Mountain in Nye County is being reactivated** on a major scale by the Fresnillo Co., of Fresnillo, Mexico. Preparatory work was started in July, and many workmen were moving into the townsite which has been all but deserted since 1952. Morrison-Knudsen Co. has been given the contract for

# Boulder Crusher AR-180

***Six of these huge crushers are being supplied for use underground in Swedish iron mines at Kiruna and Malmberget.***

The AR-180 with its 71" x 55" feed opening is the largest single-toggle type Jaw Crusher in the world. It can accept blocks of iron ore up to 10 tons and reduce these to 16" thickness. It can be dismantled into component parts suitable for transportation and erection underground.

***Built in three sizes***

| TYPE | FEED OPENING | SETTING | MIN. MINE SHAFT DIMENSIONS | NETT WEIGHT |
|---|---|---|---|---|
| AR–120 | 47" × 35" | 12" | 36" × 73" | 81500 lbs |
| AR–150 | 59" × 47" | 12" | 57" × 89" | 170000 lbs |
| AR–180 | 71" × 55" | 16" | 60" × 98" | 256000 lbs |

Single-toggle design — simple and strong.
Frame in sections, with interlocked bolted joints.
Side frames for the AR-180 and AR-150 are of heavy steel plate.
SKF spherical roller bearings — grease lubricated throughout — avoiding oil leakage. Low idling power consumption.

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In their operations as high as 13000 feet in the Peruvian Andes at Toquepala, Peru, Southern Peru Copper is using P&H Electric Shovels. Their maximum availability and minimum maintenance are vital to high production. In addition to 10 P&H Model 1800 machines, Southern Peru Copper has purchased 23 P&H diesel powered excavators.

*Only P&H Electric Shovels have these outstanding exclusive features.*

**MAGNETORQUE®**. . . the electro-magnetic type coupling that transmits power from the hoist motor to the dipper for faster action, eliminating shock and impact to the hoist gear train and motor. Response is immediate to varying load conditions.

**ELECTRONIC CONTROLS** . . . providing the fastest action of any type of control available on electric shovels. All motions are smoother, resulting in consistently higher output.

Whether it's big P&H Electric Shovels from 3½ through 8 cu. yds., or smaller P&H excavators, it will pay you to choose from the P&H complete line. P&H offers single source responsibility for all your open pit mining needs.

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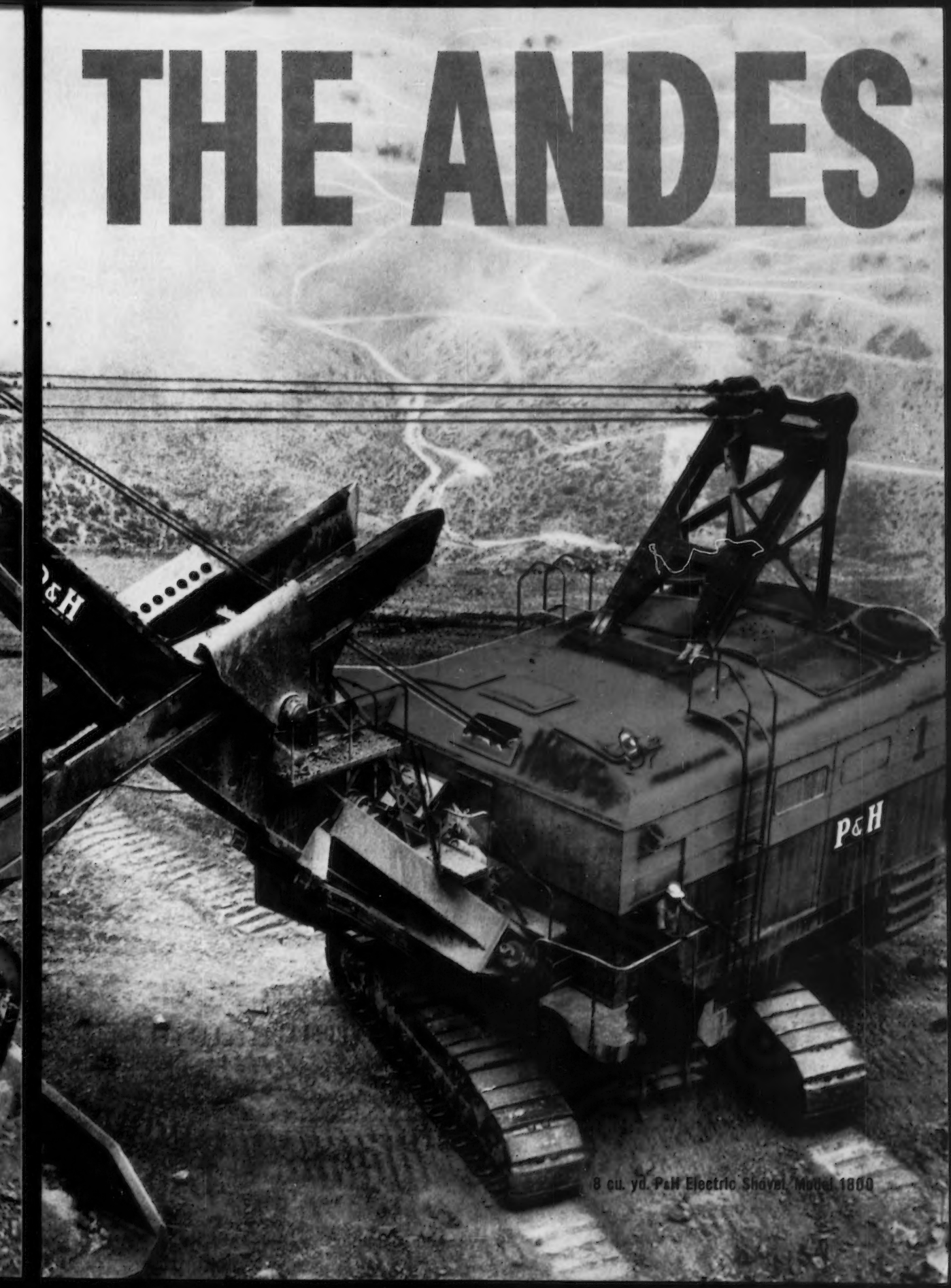
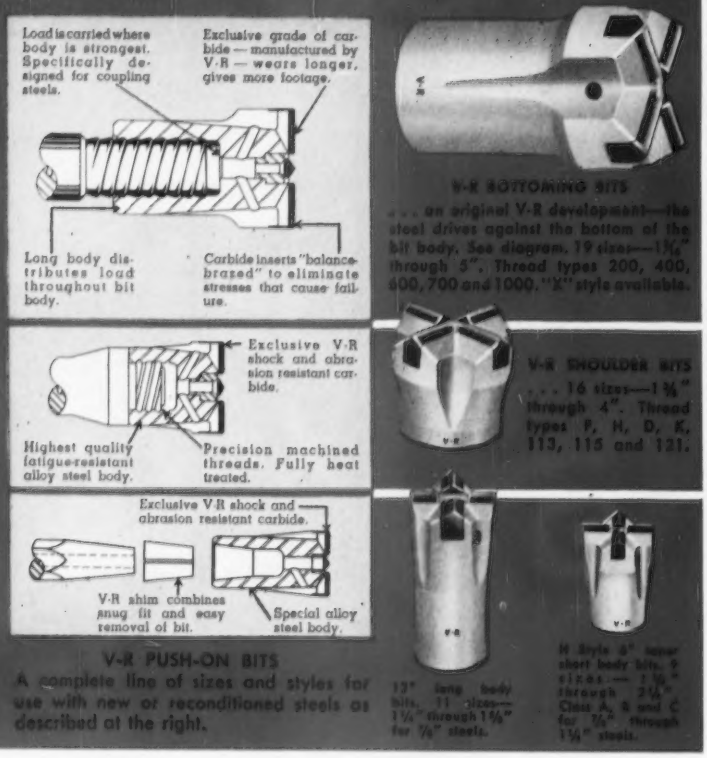
# THE ANDES




8 cu. yd. P&H Electric Shovel, Model 1800

# V-R BITS...
## drill more on any job!


Load is carried where body is strongest. Specifically designed for coupling steels.
Exclusive grade of carbide — manufactured by V-R — wears longer, gives more footage.
Long body distributes load throughout bit body.
Carbide inserts "balance-brazed" to eliminate stresses that cause failure.
V-R BOTTOMING BITS
. . . an original V-R development—the steel drives against the bottom of the bit body. See diagram. 19 sizes—1⅛" through 5". Thread types 200, 400, 600, 700 and 1000. "X" style available.
Exclusive V-R shock and abrasion resistant carbide.
Highest quality fatigue-resistant alloy steel body.
Precision machined threads. Fully heat treated.
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Exclusive V-R shock and abrasion resistant carbide.
V-R shim combines snug fit and easy removal of bit.
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A complete line of sizes and styles for use with new or reconditioned steels as described at the right.
13° long body bits. 11 sizes— 1¼" through 1⅝" for ⅞" steels.
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Wherever there is rock, V-R Bits are building a reputation for fast, low cost drilling. There are good reasons:

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## Nevada *(Continued)*

stripping operations, and the big mill will be raised 17 ft. Much of the machinery will be replaced in the rebuilt mill, and actual dredging and milling is expected to start in the spring of 1958. It is expected that the payroll will exceed 100 men when operations start, and Al Blumenauer, resident manager for the Fresnillo Co., has sought to rent the Round Mountain school house to help meet the housing demands. Extensive drilling and exploration has been carried out for many months, and it is reported that vast tonnages of better than marginal gravel have been blocked out. The present plant, one of the largest in Nevada, was built by the Round Mountain Gold Dredging Corp in 1950 at a cost of more than $3-million to dispose of 17,000 tons of alluvial material or gravel daily. The project was closed after two years for mechanical and economic reasons.

**Copper Trio Mines Inc. is shipping 4%** copper ore from its property near Luning under a contract with Kaysville Uranium Inc., Kaysville, Utah, which calls for a minimum of 100 tons and a maximum of 500 tons weekly. L. A. Smith, president of Copper Trio Mines says the contract covers mining and shipping operations, and that leaching will be done at the Utah plant.

Project is a joint venture, and each of the firms holds 50% of the stock. Heavy machinery has been put to work improving the road between the open pit mining property and the railroad siding at Luning. The road project cost was estimated at $20,000.

**Pahrump Mining Co. in Clark County reports having hit one of the biggest gold strikes** made in southern Nevada since 1907. Officials reported that 1-million cubic ft of reported gold-containing placer gravel has been assayed at $1.74 per ft. Location of the deposits is 19 miles north of Pahrump in the area of the old Johnnie and Congress mines.

**Combined Metals Reduction Co. on Aug. 1 closed down its Caselton Mine** in Lincoln County, leaving more than 100 men out of work. The mine has been a large producer of lead and zinc for the last 30 years, and one of the mainstays of Lincoln County's economy. H. E. Swanson, in making the announcement, said operations would be suspended for an indefinite period, and milling operations would stop when present stockpiles were exhausted. "The company very much regrets having to make this announcement to its employes and sincerely hopes that metal prices soon will be such that operations can be resumed," Mr. Swanson said.

**Wah Chang Co.'s Tempiute mine, one of Nevada's largest underground operations, closed during July,** putting 150 men out of work. Failure of the Government to support the price of tungsten was given as the reason. The Tempiute mine has been one of the state's leading tungsten producers for the last several years, and two major road building projects were underway at the time of the closing to provide good access routes to

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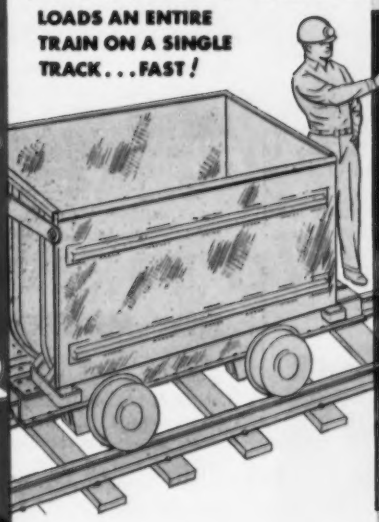

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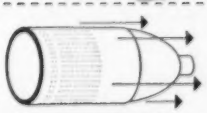

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## Nevada *(Continued)*

the Tempiute site. It is believed that the road building will continue, since the contracts have both been let, and work has progressed to considerable extent. Only a skeleton crew remains at the mine to watch the equipment, all of which is being left in place. Tempiute townsite had a population of 500 at the time of the closing order.

**Nevada Massachusetts Co., Nevada's largest tungsten producer, announced a second cut-back in operations** during July, and 100 more men were left without work. The force, which was 275 men during the last several years, has been reduced to a crew of 75 which will be maintained to keep watch over the company's properties. Charles N. Segerstrom Jr., president of the company said the closing was necessary due to the low price paid for tungsten. The mine is in Pershing County just north of Highway 40.

**Nevada Mines Division of Kennecott Copper Corp. ceased most of its operations during the first week of July in order to permit the installation of a new car dumper** at its concentrator. The old car dumper had been in use since 1931 and was subject to mechanical failure. The new dumper is similar in design but of heavier construction, and according to John C. Kinnear Jr., general manager of the company, it should assure uninterrupted production and processing.

**Anaconda Co. on July 1 announced it had reduced production at its Yerington mine** at Weed Heights by 16%, or approximately 416 tons of copper per month. The cutback was accomplished by placing operations on a five-day week basis instead of six days, which had been in effect for the previous few months. A. E. Millar, general manager of the company, said there will be no employment cutback, but that the plant will remain idle on Saturdays and Sundays. The mine employs 525 people.


A satisfied customer writes about JOY LIMBEROLLER Belt Conveyor Idlers:

LIMBEROLLERS, at work on conveyor at Massachusetts Broken Stone Company.

"Early in 1955 we decided to try four Joy Limberollers on the No. 1 slope conveyor from the primary gyratory crusher in the quarry.

"This conveyor carries the product of the primary crusher set at about 5', on a 12 degree slope and running at about 450 feet per minute. Originally designed for 400 ton per hour capacity, there have been surge loadings of twice this amount.

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"The Limberollers have carried a few hundred thousand tons of heavy stone with absolutely no maintenance. On the basis of this record we have placed repeat orders."

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## NEW MEXICO

**Calumet & Hecla, Inc. has awarded a contract to the Banes Co., Inc., of Albuquerque,** for the construction of a plant for its undeveloped uranium orebody at Grants. The estimated 500,000 tons is being increased by further drilling and exploration.

**Lisbon Uranium Corp., Atlas Corp.-controlled mining firm with headquarters at Salt Lake City, reports discovery of commercial grade ore** in completion of first stage of reconnaissance drilling on the San Mateo prospect in McKinley County.

A. P. Kibbe, Salt Lake City, Lisbon president, said grade of ore and thickness in holes drilled to date, made the discovery one of commercial proportions.

The San Mateo Dome project covers 14,000 acres located about 8 miles east of the Ambrosia Lake District. Participants in the project include Lisbon and Minerals Projects-Venture "B" Ltd. and the Yucca Mining and Petroleum Co.

E. J. Longyear Co. is running the exploration program.

**Cyprus Mines Corp. of Los Angeles has leased three sections of land in McKinley County** from Yucca Mining & Petroleum Co. Inc.

Under terms of the arrangement, a substantial sum is paid to Yucca which receives 10% over-riding gross royalty.

Cyprus already has two drilling rigs operating in these sections. Henry T. Mudd is the president of Cyprus.

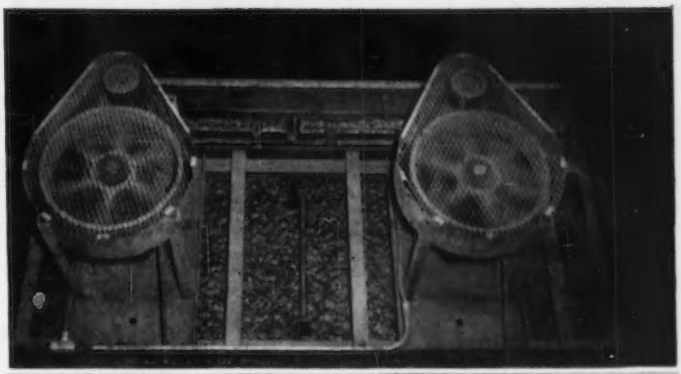
## NEW YORK

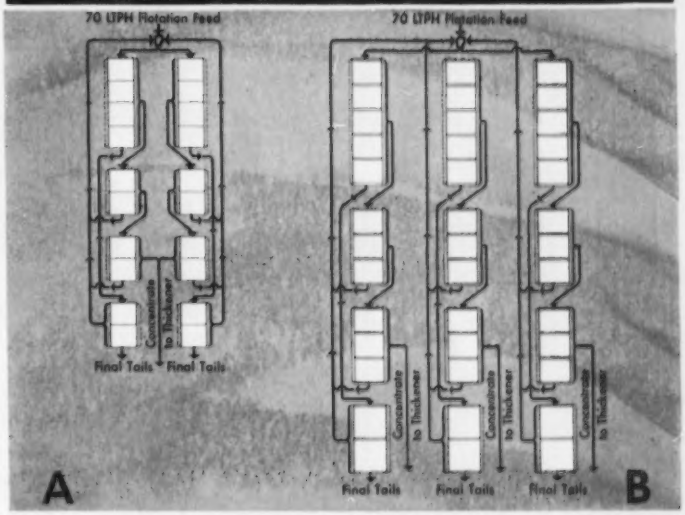
**A $50-million, 7-year industrial expansion program adding nearly 100,000 tons of annual productive capacity at plants throughout the country has been completed** by National Carbon Co., Division of Union Carbide Corp., Adger S. Johnson, president of National Carbon, has announced.

Mr. Johnson explained, "In 1955 we launched the second phase of expansion that brought our 7-year total to approximately $50-million. New baking furnaces and equipment rearrangement and process improvements at Columbia have given us highly desirable productive flexibility. More than ever before we have manufacturing capabilities common to

WEMCO

# Fagergren Flotation 8 ways better!



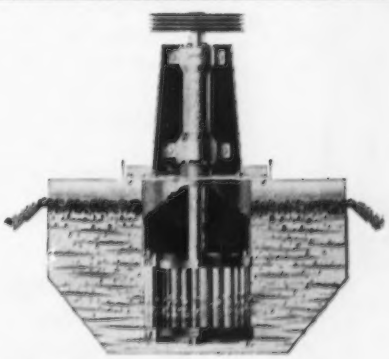



**here's the proof:** In an efficient new iron flotation concentrator, two parallel flotation circuits are used. Each receives identical feed, and each handles 70 long tons per hour with grade meeting market requirements. Check and compare these facts:

| | | Wemco Fagergren Units A | Other Flotation Units B |
|---|---|---|---|
| **Circuit Characteristics** | ✓ Number of Cells | 20 | 39 |
| | ✓ Gross Cell Volume[1] | 1220 cu. ft. | 2400 cu. ft. |
| | ✓ Floor space (all cells) | 644 sq. ft. | 988 sq. ft. |
| | ✓ Launder & Operating aisles (approx.) | 167 sq. ft. | 261 sq. ft. |
| | ✓ Total Launder Length (approx.)[2] | 225 ft. | 375 ft. |
| **Typical Metallurgical Results on This Type of Iron** | ✓ Units of Iron Recovered | 1%-2% more | |
| | ✓ Tailings Loss | 1%-2% less | |
| | ✓ Reagent Consumption | .2-.3 lbs. less per ton treated | |

**Notes:** 1 – Taggart, Section 12 page 80, shows WEMCO-Fagergren efficiency of cell volume substantially greater than others, in addition to the above noted advantage in space alone.

2 – Shorter launder length in WEMCO circuit allows steeper slope; requires less wash water, causing less dilution of concentrate and minimizing dewatering requirements.



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## New York *(Continued)*

both carbon and graphite products, and can adjust these facilities as the ratio of demand changes.

"The expansion program has not been limited to Columbia alone," Johnson added. "Plants at Niagara Falls, N. Y., Clarksburg, W. Va., and Cleveland and Fostoria, Ohio, have participated, both in the addition of new facilities, and in equipment rearrangement and process improvements. A new plant is now getting into production of carbon products at Lawrenceburg, Tenn., using a revolutionary new process for forming and baking.

## NORTH CAROLINA

**Carolina Pyrophyllite Co., a subsidiary of American Acoustical Tile Co.,** Lansdale, Pa., is constructing two water reservoirs in the Bowling Mountain area near Stem, in Granville County, preliminary to beginning of operations in the area.

Water in the reservoirs, covering 20 acres, will be used in the flotation system of reducing the ore, according to J. B. Hume, who is in charge of the project. Long-range development plans contemplate a reduction plant.

**The board of directors of Haile Mines, Inc., a tungsten firm of Vance County, on Aug. 1 authorized management of the** company to acquire Frank Samuel & Co., 68-year-old mineral, metal and chemical export-import firm and refractories manufacturer of Philadelphia.

Samuel Co., which has a net worth of approximately $1.2-million plus sales of more than $11-million, is a factor in the importation of iron, chrome, manganese, columbite and tantalite ores and non-metallic minerals such as zircon, rutile, beryl, lithium and fluorspar. It represents four European manufacturers in the imports of fine chemicals to this country.


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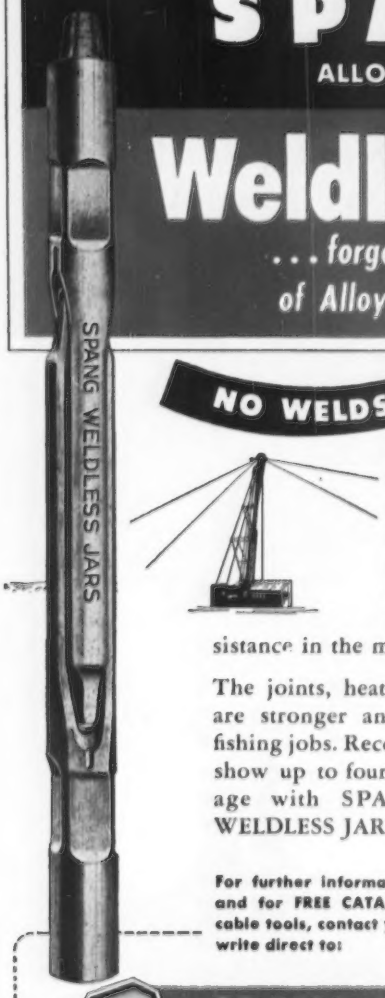




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For over 60 years Manufacturers of Spang Weldless Jars and a Complete Line of Cable System Drilling and Fishing Tools for Oil and Gas Wells, Water Wells, Prospect Drilling and Shot Blast Holes.


## OHIO

**International Salt Co., Inc. has been granted a 50 year lease for a $7½-million** salt mining project under the waters of Lake Erie. Edward R. Fuller, International's president, said company would sink a 2,000 ft shaft on Whiskey Island, near mouth of Cuyahoga River, and would tunnel from there to get at the salt. Lease covers more than 5,000 acres under Lake Erie on Cleveland shore. Ohio will receive 5c a ton for rock salt taken from mines.

**A jointly sponsored expedition will sail from Cleveland this month on a 3-year search for northern iron ore, oil, uranium and gold.** Venture is financed by Scurry-Rainbow Oil, Ltd., RKO Theaters Corp., and interests of Cyrus S. Eaton. Scurry-Rainbow will operate the expedition consisting of a former British submarine chaser (re-christened Coastal Queen) carrying a helicopter and exploratory team headed by Ross Toms, Canadian prospector. Thomas H. Jones, Scurry-Rainbow chairman, said expedition will maneuver in sub-Arctic area in the summer (near Baffin Island) and will move south, possibly to Cuba or other regions, in summer months.

## OREGON

**Extensive testing and sampling of lateritic nickel deposits in Josephine County will be undertaken by New Delhi Mines, Ltd.** Orebodies are about 60 miles from Hanna Nickel Smelting's ferronickel operation.

Edward W. White, company president, said studies to date have been directed primarily to nickel and iron content, although chromium is also reported. He said churn drilling and assaying operations over the past three months have indicated substantially more than 15-million tons of commercial ore. It was his expectation that a step-up in drilling operations would "prove-up" 20-million tons within 30 days.

## TEXAS

**Reynolds Metals Corp. has named the alumina plant at Corpus Christi in memory of the late R. S. Sherwin Sr.,** former vice president and leading authority on

One of many reasons why **ALLIS-CHALMERS MOTORS** are preferred for outdoor applications in the

**MINING INDUSTRY**

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LESCHEN WIRE ROPE DIVISION


### Texas *(Continued)*

alumina. The facility was previously called La Quinta.

Mr. Sherwin died July 2 at Corpus Christi at the age of 80.

**Consolidated Chemical Industries Division of Stauffer Chemical Co. has completed plans to more than double the capacity of its sulfur recovery plant at** Baytown. Construction is scheduled to begin at once, and it is anticipated that the new unit will be on stream early next year.

## UTAH

**Uranium-vanadium ore worth about $30 a ton** has been encountered by Good Hope Investors Inc. of Boise in two diamond drill holes put down on its property in San Juan County, west of Blanding, President Earl C. Heffner reported recently. The ore bed is six to seven ft. thick and lies at a depth of about 110 ft., he said. Close-spaced drilling is now in progress to delineate the ore zone between the two holes which are about 500 ft. apart.

**Centennial Development Co., Eureka mine contractors, have been awarded contract for 2,000 ft of exploratory drifting and cross-cutting** in the Bear Creek Mining Co.'s East Tintic district lead-silver-zinc project.

Bear Creek, a domestic exploration affiliate of Kennecott Copper Corp., reports the 2½-compartment shaft has been bottomed at 1050 feet where contractor, Centennial, is cutting a station.

Chief Consolidated Mining Co. and the Tintic group of companies (including Tintic Standard Mining Co.) own the properties on which Bear Creek is conducting the venture.

**Zuma Uranium and Oil Corp. has informed shareholders that it will attempt to arrange for an exploration program on its boundaries** in the East Tintic District.

Feno Tedesco, president of the firm, said that Zuma had been negotiating with Bear Creek Mining Co. over development of the properties in connection with Bear Creek's East Tintic venture with Chief Consolidated Mining Co. and the "Tintic Group of Companies" (Tintic Standard, etc.).

However, Tedesco said, Bear Creek has informed Zuma, that there could be no action on their negotiations until March 1958.

"Since known ore has been encountered on Zuma's boundary (by Bear Creek in core drilling), the board of directors is trying to arrange for Zuma exploration of this part of the property, he said.

Bear Creek is domestic exploration subsidiary of Kennecott Copper Corp.

## WASHINGTON

**Sunshine Mining Co.'s first exploration**

## Washington *(Continued)*

**well in the coastal area of southwestern Washington struck oil** on July 16 at a depth of 3965 ft. Preliminary drill stem tests flowed at the rate of 400 barrels a day, 46-48 gravity, and production tests are now in progress to determine whether the well is commercial.

The test well, known as the Sunshine-Tanner-Medina No. 1, was spudded in on June 19 on a 5000-acres lease block in Grays Harbor County near Ocean City. Associated with Sunshine in the venture are J. W. Tanner of Olympia and other private individuals. The drill site tract is owned by Medina Land Co. of Seattle, but the lease-block also includes state and county property.

The discovery, which promises to make Washington the nation's 30th oil producing state, has touched off a flood of applications to the State Land Office for gas and oil rights on state-owned lands in the counties bordering the Pacific Ocean. Within a week leases on more than 300,000 acres had been granted and receipts to the state were in excess of $150,000.

**Thomas Consolidated Mines, Inc., former Wallace firm which now maintains its headquarters in Spokane,** has acquired the old Valley Mine in Ferry County, near Republic and plans to investigate its potential for production of both gold and selenium. The property was a profitable gold producer before it was forced by government order to close down at the outbreak of World War II, and has been developed by an inclined shaft with four levels. Previous mining operations, however, were confined to the two upper levels. The company is planning to apply for federal loan-aid from the Defense Minerals Exploration Administration on an appraisal of the selenium values which have been identified on the Valley Mine ore.

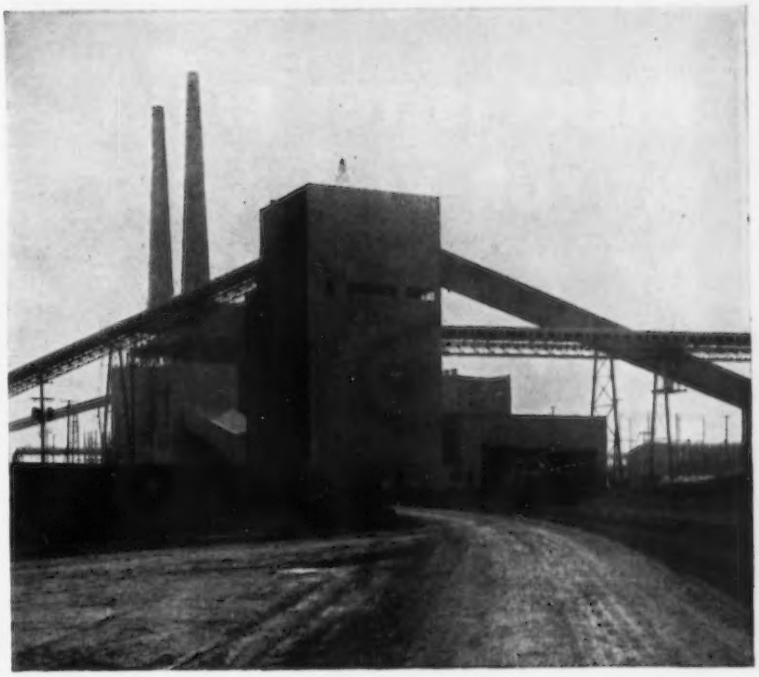
## WYOMING

**About 1,200 acres of iron ore property owned by the Ruby Co. of Boise in Fremont County, south of Lander, have been turned over to United States Steel Corp.'s Columbia-Geneva division** for exploration and development under a 75-year lease. Preliminary engineering investigation of the property by U. S. Steel has been underway for several months under an option, a test tunnel has been driven and extensive milling tests of the ore have been run. The option was taken up July 1.

The Grand Junction Operations Office of AEC closed the Crooks Gap buying station in Fremont County on July 31, 1957.

AEC said with commencement of operations of the Western Nuclear Corp. mill at Crooks Gap, that district along with Gas Hills production is assured a market for ore from independent operations.

The AEC said that "Arrangements have been made with Western Nuclear to continue buying of independent ores at about the same rate as during the

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**SOLUTION:** Quaker engineers and the Quaker distributor's men, working with engineers of the power plant, suggested the use of a belting designed for high lifts and long center distances. Over 7,000 feet was installed.

**RESULT:** The three conveyor systems work smoothly and efficiently, carrying coal into the plant at the rate of one million tons a year.

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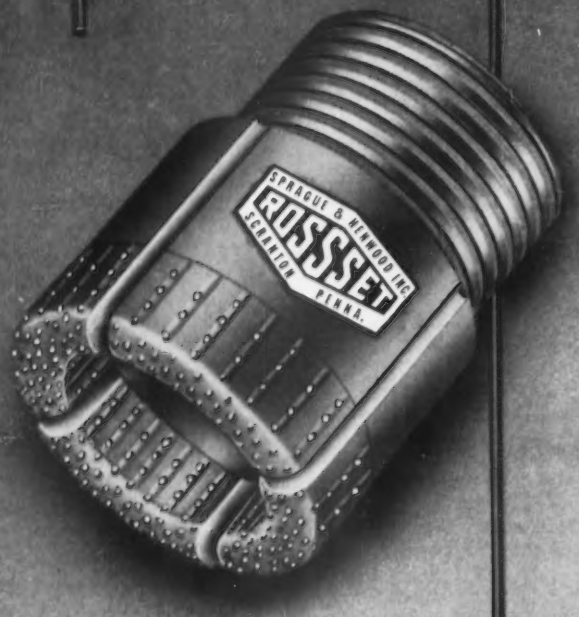


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## Wyoming *(Continued)*

period of provisional buying which commenced Dec. 17, 1956.

**A new Wyoming uranium rush is under way in Shirley Basin, north of Medicine Bow.** More than 1,000 claims were staked in the final two weeks of July.

About 200 men have been staking claims, and nine drilling rigs have gone up to confirm ore locations.

Major companies participating in the rush are Teton Exploration Drilling Co., Tidewater Oil, Kerr McGee, Shoni Uranium and Utah Exploration Co.

Teton has held 1,800 acres in the area since 1955, but most of the other claim staking came in the final two weeks of July.

**The controversial Rule 31 of the Wyoming Mining code was abolished at a special meeting of the state board of mines with uranium operators in Fremont County.**

Rule 31 sought to spell out exactly how walls should be sloped in open pit mines. Operators opposed the regulation, preferring a more general safety regulation.

Representatives of most major companies in Wyoming said safety in mines could best be guaranteed through a system of inspections by technical advisors provided by the board of mines.

Some uranium operators said that specific requirements on slope of walls and depth of benches that must be left in excavation might actually create hazardous conditions in some instances.

**Fees for uranium prospecting on the Wind River Indian reservation in Fremont County have been reduced** from $200 to $25, according to Lynn W. Jenkins, land officer for the reservation.

In addition, three large areas on the reservation have been opened to prospecting for the first time.

Jenkins said there has been a recent drop in amount of prospecting on Indian land.

**Uranium committee of the Wyoming Mining Assn. has been organized** with H. D. Hand of Globe Mining Co., Casper, as chairman. Hand appointed A. V. Quine of Lucky Mc Uranium Corp., Riverton, as vice chairman, and Vern Hughes of Shoni Uranium, Riverton, secretary.

**Vitro Minerals Corp. has contracted to mine and develop 51 uranium claims in the East Gas Hills district** of Fremont County. Claims are owned by Shoni Uranium Corp.

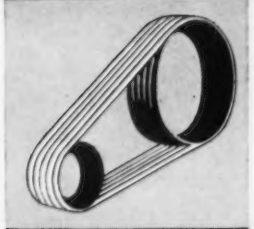
Contract covers four groups of claims, including the Jackneese and Blackstone claims and Sage Hen lease about 60 miles east of Riverton.

Vitro acquired a 10-year holding on all commercial mineable uranium ore in the claims. Shoni will receive an undisclosed sum in cash, plus a percentage of the gross sales price of mined ore or a share in the annual net profit.

Vitro also purchased nine additional claims and acquired options on 36 other claims in the same general area.

Vitro purchased from Vern Hughes

TEXROPE



DRIVES

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- positive locking
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**HERE'S THE KEY.** This combination keylock from disc to hub makes adjustment easy.

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✓ Key lock won't slip — setscrew can't fly out.

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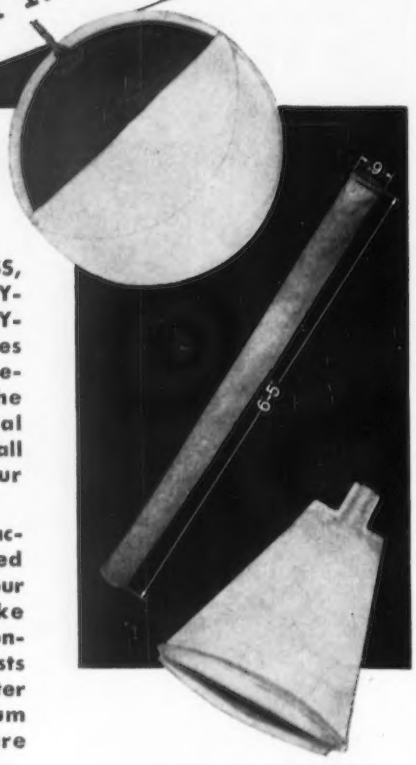


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## Wyoming *(Continued)*

and Sam Stanbury of Riverton the Myrna Lynn mine and surrounding properties known as the nine Veca claims. Myrna Lynn mine has produced and shipped substantial quantities of uranium ore.

Vitro also acquired one-year options to lease 21 claims of the Hughes Mining Co. and 15 claims of the so-called H&S group owned by Hughes and Stanbury.

The recent acquisitions make 278 claims held by Vitro in Wyoming.

**Bullrush Mine in the Crooks Gap area of Fremont County, has begun shipment of uranium ore** to the Western Nuclear mill in Jeffrey City.

About 250,000 cubic yd of waste material was stripped off, leaving a 200x 300 ft pit at an average depth of 80 to 110 ft. Additional stripping is under way which will approximately double the size of the present pit.

Bullrush does not plan to stockpile any ore on its property except for minor tonnages of marginal grade ore produced from fringe areas.

**Gross uranium ore sales of Four Corners Uranium Corp. were up to $611,410** for first five months of this year from $468,247 in 1956, President E. H. Sanders said. Four Corners has over 100 claims in the active producing Gas Hills area in Wyoming.

**Western Nuclear Corp. has applied to the AEC for authority to triple capacity of its mill at Jeffrey City.**

Proposed expansion, if approved, would boost the mill's capacity from 400 to 1,200 tpd uranium ore.

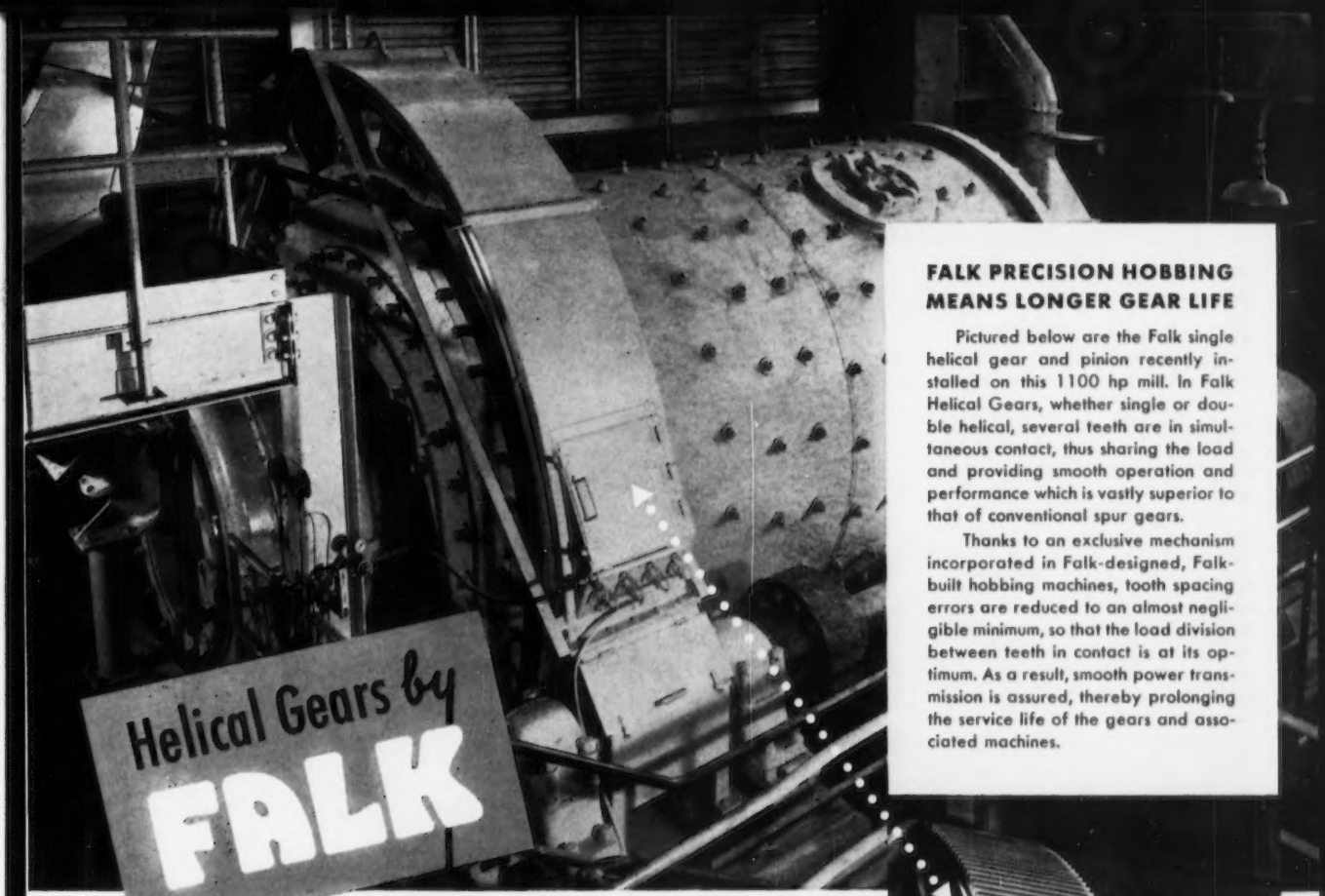
Bob Adams, Western Nuclear president, said an "increase in our company's uranium reserves and other uranium reserves warrant expansion of this mill.

The mill began operation July 11. Official dedication of the plant and community of Jeffrey City were scheduled for Sept. 12.

**Multi-million dollar monazite deposit has been discovered near Dubois** by the Little Jim Mining Co. of Casper. Orebody (in form of monazite sand and rich in thorium) is 11½ miles long and believed to be largest monazite deposit in the United States. Rex Robertson, owner of mine's controlling interest, said that several companies are interested in operating the lease and predicted dredging would be started by next spring. He also said there are a few million tons of monazite in the deposit running 20 to 40 lb per sq yd with plenty of water available for dredging operations.

Discovery was made more than a year ago, but Robertson said it was kept secret until company was sure of its claims and had thoroughly assayed the sands.

**Uranium orebody estimated at 200,000 tons of 0.35% $U_3O_8$ has been discovered** in the Gas Hills district by Radorock Resources, Inc., and Federal Uranium Corp. Floyd B. Odlum, president of Atlas Corp., is hoping to establish a uranium mill in the district where sev-




## FALK PRECISION HOBBING MEANS LONGER GEAR LIFE

Pictured below are the Falk single helical gear and pinion recently installed on this 1100 hp mill. In Falk Helical Gears, whether single or double helical, several teeth are in simultaneous contact, thus sharing the load and providing smooth operation and performance which is vastly superior to that of conventional spur gears.

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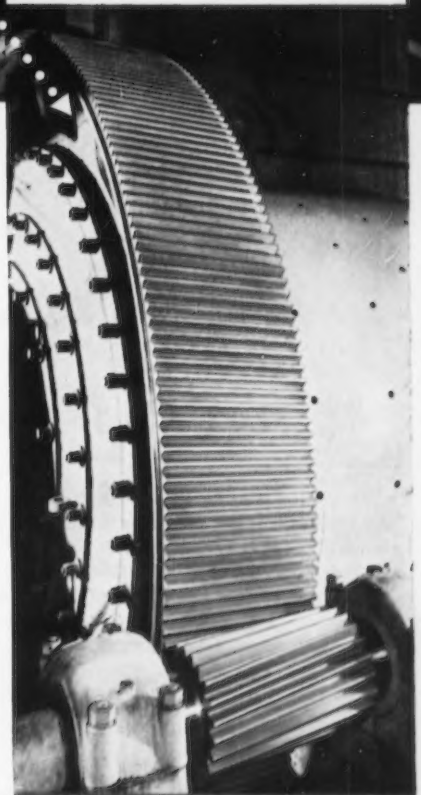

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This modern beneficiation plant employs latest methods throughout all operations. Here Guartec is used as a depressant in flotation.

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Guartec will scour most gangue-coated values which otherwise escape collector action. In a base metal mill, tailings containing .57% copper and .92% zinc sulphides were retreated using 1.2 pounds of Guartec per ton to depress the insol. Recovery: 9 pounds of copper and 14 pounds of zinc per ton of tailings with 94% of the insol rejected—typical performance for low cost Guartec.

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General Mills

## Wyoming *(Continued)*

eral major firms already have mill proposals before the AEC.

Attorney for both Federal and Radorock, C. Allen Elggren, said that Federal was exercising options under its agreement with Radorock whereby it would obtain 50% operating interest in the properties.

Discovery was made in course of a current core drilling program. Values at present are based on radiometric surveys but chemical analysis of cores is underway. Ore finds in a "thick formation" are suitable to open pit mining methods while grade at 0.30% to 0.35% $U_3O_8$ is substantially above the 0.20% $U_3O_8$ average in the district. Claims are adjacent to holdings of Globe Mining Co. and are about one mile west and slightly south of the Lucky Mc Uranium Co. properties.

# IN CANADA

## QUEBEC

**Tunnel crews working under pressure on two shifts a day** have averaged more than 200 ft a week on four separate headings in the driving of the Chute-des-Passes power development tunnel. The six-mile tunnel is a vital element in a 1-million horsepower project that will increase hydro-electric power resources of Aluminum Co. of Canada in Quebec to more than 3,580,000 hp.

Perini-McNamara-Quemont Construction Companies, a joint venture, has 1,580 men on the project which is to provide power by April 1959. Associated contractors have about 300 men on payroll.

## ONTARIO

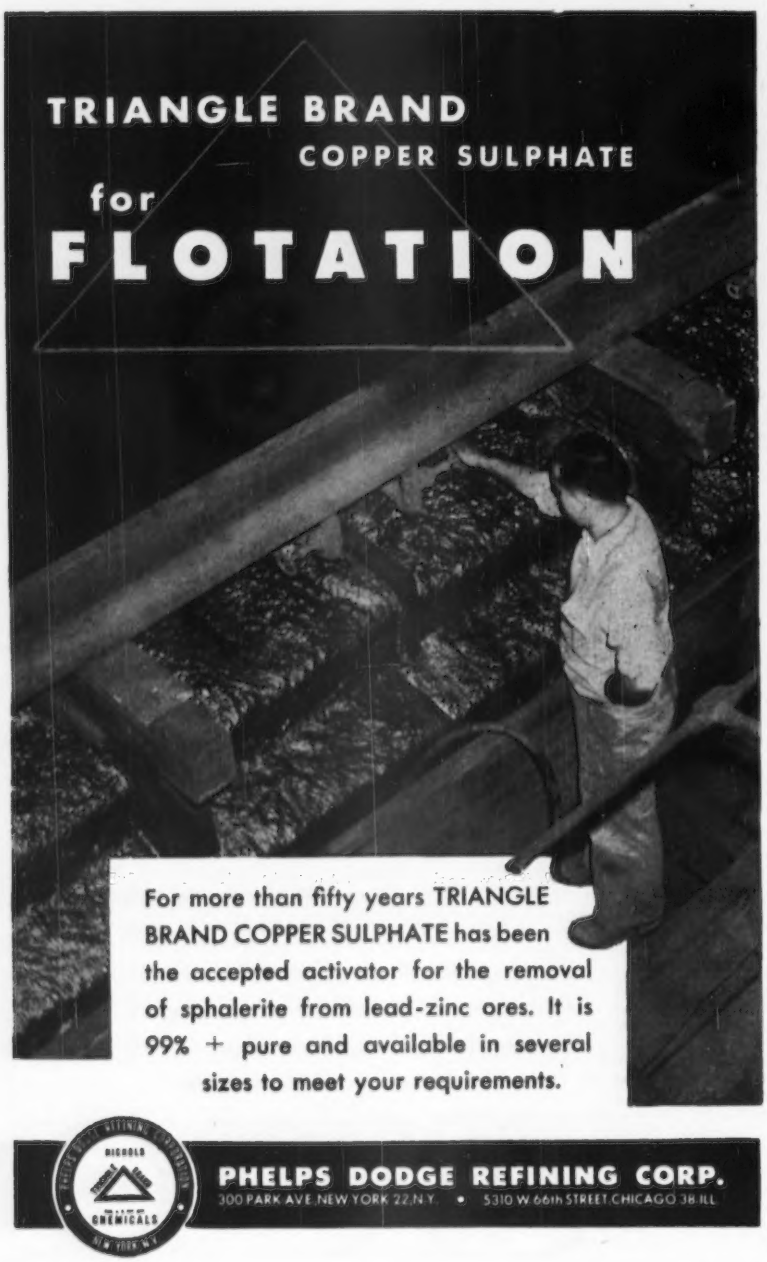
**Faraday Uranium Mines has made a new find** at its Bancroft area uranium producer. The new zone, located about halfway between the No. 1 and No. 2 shaft areas which are roughly 1200 ft apart, is open at both ends and has not been investigated vertically yet. The discovery was opened initially on one level only, the 450, or third, level, for a length of 130 ft with indicated average width of 20 ft. Muck samples averaged 0.175% uranium oxide.

**Consolidated Denison is steadily increasing the mill rate** at its uranium producing mine in the Blind River area. Only one unit of 3,000 tpd capacity is now in operation, but the company expects that operations at the rated capacity of 6,000 tpd will be achieved as scheduled by the end of November. To early August overall recovery averaged 87.7% with average grade of ore milled 3.08 lb per ton.

**Willroy Mines has achieved production in record time.** Canada's newest base metal producer and the first in the Manitouwadge camp started production six months ahead of schedule, 16 months from the time shaft sinking started. Initial mill rate was 400 tpd and this is steadily being increased to 750 to 800. It is anticipated that at this rate production would amount to about 125 tons of zinc concentrate and 25 tons of copper concentrate daily. Rated capacity is 1,000 tons. Indicated ore reserves at start of production (July 31) was estimated at 2,273,000 tons averaging 1.1% copper, 6.85% zinc and 1.76 oz silver per ton.

**Developments at Cochenour Willans Mines in the Red Lake area have added substantially to ore potential.** Production this year is expected to show a 25% increase over 1956, while high grade ore is continuing to be developed in the west and northwest zones. It is estimated that the west zone should average 1 oz gold per ton; the bulk of mill feed will be taken from this zone in the years to come. Grade in the first six months of this year averaged $26.95, against $22.34 for the full year 1956, and $17.95 for the previous year. Shaft deepening of 1,000 ft to open eight new levels down to 2,175 ft has been started.

**Diamond drilling at the copper-nickel property of Eastern Mining and Smelting in the Gordon Lake area,** 55 miles northwest of Kenora, has indicated an entirely new ore zone. On the basis of 12 holes drilled over length of 300 ft and down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For more than fifty years TRIANGLE BRAND COPPER SULPHATE has been the accepted activator for the removal of sphalerite from lead-zinc ores. It is 99% + pure and available in several sizes to meet your requirements.
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## See how the Yieldable Arch "*gives*" under excessive pressures

That is just what Bethlehem's Yieldable Arch was designed to do. Each arch set is made up of segmental sections which nest together at points of overlap, as is clearly shown in illustration. These overlapped joints are held by U-bolt clamps which are drawn up tight enough to create the right amount of friction. Under excessive load, however, the joint will yield, which it has already started to do in the installation shown above.

Where underground conditions are difficult no rigid roof support, however strong, can indefinitely withstand the dynamic pressures caused by the weight and subsidence of the overburden. What's needed is a support scientifically designed to yield *gradually*, in order to keep the drift open while an area is being worked out.

Thus you can see that it's not the strength but the "give" of the Yieldable Arch that holds a tunnel or drift open. Because the arch sets yield before the steel deforms, they are recoverable for use elsewhere. In mines where the Yieldable Arch is at work, it is paying for itself amazingly quickly, sometimes in a matter of months.

The Yieldable Arch is easy to install without special equipment or skills. One of our engineers will be glad to look over your workings and see what the Yieldable Arch has to offer you. You can reach him by calling or dropping a line to the nearest Bethlehem district sales office.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

**BETHLEHEM STEEL**

BETHLEHEM STEEL

After drilling 15 to 20 shoot-holes, the Tractair moves to the next job. "We save time and labor because the Le Roi unit doesn't need to be babied into position," says Green. "We drive the Tractair onto rocks, slopes, or loose ground and start drilling."

# Tractairs* Save $150 a Day at Blasting Site

## Le Roi tractor-compressor used to drill shoot-holes for blasting overburden

## Easier and safer to handle on rough terrain than dozer-drawn compressors, superintendent says

The V. N. Green Co., Brown's Branch, W. Va., saves $50 per day at each site by using Le Roi Tractairs to drill shoot-holes for blasting surface rock at their strip mining operations. When all three Tractairs are used, as is generally the case, daily savings total $150, reports John W. Green, job superintendent.

Previously-used wheel type compressors had to be moved around the site by a standby dozer. The 10 to 15 moves per day took two hours. The dozer lost the same amount of time, too, when its work was interrupted.

### Mobility Minimizes Delays

Green points out that now "the Tractair is driven directly to the drilling area, the hose is attached, and drilling starts at once." In addition, Tractair's easy maneuverability over the extremely rough terrain cuts previous relocation time by more than half, and eliminates the need for the dozer as well as the operator.

Because it's self-propelled, the Le Roi tractor-compressor is ideal for this type of work. When a job is done, the Tractair provides fast transportation for the operator, drill, and compressor to the next site. There's no need to wait for other equipment to make the move.

What's more, close-to-the-job air power shortens hose lines, substantially reduces hose damage, and eliminates power loss. The shorter lines and Tractair's 125 cfm output permit the use of two drills, when necessary.

### Performs Various Jobs

Bought originally for drilling shoot-holes, the Tractair can be used for other jobs, too. "We also use our Tractairs to break paving on road construction jobs where we do the resurfacing, to tamp backfill for drain pipes, and even to clean pavement by using a rotary brush attachment."

The self-propelled, multi-purpose Tractair can provide similar savings for you. And its ready adaptability to a wide range of attachments can help you reduce the cost of operations requiring costly, one-purpose equipment. Contact Le Roi today.

*"Tractair" is the registered trademark for Le Roi's combination tractor—air compressor.

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T-77

# collect more dust for fewer dollars!

## New 16-page booklet gives all the facts on AAF's improved Type W ROTO-CLONE

Here are the facts on the very latest improvements in AAF's Type W ROTO-CLONE—the "hottest" wet dust collector in industry since 1937. This 16-page booklet is chock full of data on arrangements, dimensions, performance characteristics, engineering data, and humidifying action.

The distinguishing feature of the Type W is the addition of water sprays to the basic principle of dynamic precipitation. This results in collection of even the lightest and finest dust particles and delivers collected dust in a slurry for easy disposal.

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Please send me Bulletin 274B which describes AAF's wet-collecting Type W ROTO-CLONE.

Name_____

Company_____

City_____ State_____

## Ontario *(Continued)*

dip 700 ft, an estimated 1,241,800 tons averaging 1.41% nickel, 0.58% copper, and 0.09 oz platinum metal is indicated. This brings total indicated tonnage in the three known orebodies to about 3.5-million tons grading 1.20% nickel, 0.58% copper, and 0.22 oz precious metals.

**Canadian Dyno is making good progress** in construction of its 1,000-ton capacity acid leaching plant at its uranium property in the Bancroft area. Preparations are in progress for mining on the second and third levels. The shaft has been completed to 1,000 ft and an additional five levels at 150-ft intervals will be opened up. The company holds a contract with Eldorado Mining and Refining for sale of $34,816,700 worth of uranium precipitates. Production is scheduled to commence at the end of March 1958.

**Sogemines Development Co., wholly-owned subsidiary of the worldwide Belgian company, Sogemines Ltd., has acquired a 27-claim nickel-copper prospect** in the Werner Lake area, Kenora district. Electromagnetic and magnetometer surveys are to be carried out following preliminary ground work, now under way.

**A U.S. firm, W. S. Moore Co., has acquired an option on a former** intermittent iron producer in the Marmora area in the southeastern section of the province. Property is estimated to have shipped some 250,000 to 300,000 tons during the 1800's. Drilling is planned shortly. Company also holds two other prospects in the area and has an interest in a third.

**Falconbridge Nickel Mines expects to complete its major expansion program by next year.** Nickel output has reached a rate of 46-million lb per year, up from 45-million lb in the previous two years. Company expects to achieve its objective of 55-million lb of nickel per year by next year.

**Chibougamau Jaculet is continuing development on three levels** at its copper property in the Chibougamau area. Most work to date has been done on the 450-ft level in the main No. 2 zone. Work on the 300 and 600-ft levels is progressing but has not yet advanced sufficiently for underground drilling. First outline drilling on the 450 has not come up to original surface drilling but is is felt that this horizon may be lean.

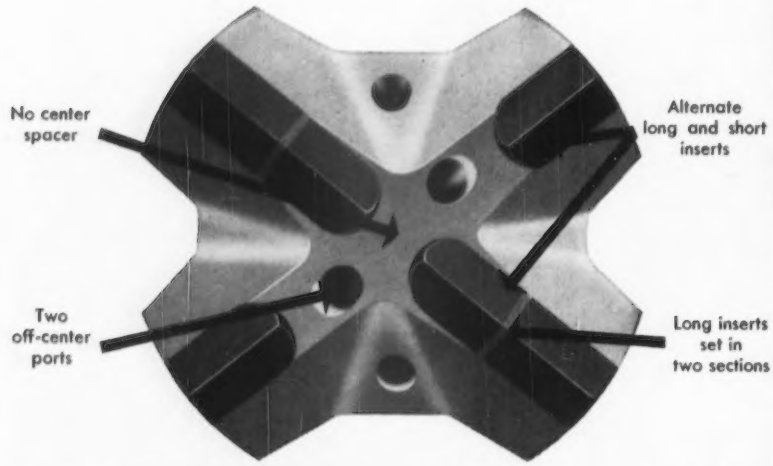
**Undergrouud diamond drilling at Quebec Chibougamau Goldfields has indicated an entirely new oreshoot** west of the present underground workings. First results gave a total of 150 ft averaging 3.64% copper, 3.15 oz silver and 0.05 oz gold across an average width of 9 ft. Downward extension of the shoot to the 800-ft horizon is being investigated. Drifting is continuing on the 200, 350 and 650-ft levels.

**Detailed drilling is being carried out on the large property of Olivier Iron and Steel Corp.** along the north shore of the St. Lawrence. Approximately 57 sq miles are held under license or mining claims, situated near river mouths along some 200 miles of the north shore from Seven Islands to Natashquan. Previous work on portions of the properties indicated large tonnage of low grade iron suitable for high grade concentration.

**Marchant Mining Co. is obtaining good results in diamond drilling** on its nickel prospect in La Motte Twp., some 25 miles northwest of Val d'Or. On results to date potential tonnage of the main zone is estimated at over 400 tons per vertical foot grading approximately 1.7% nickel across 9.5 ft on the 100-ft horizon. This is after allowance of 15% for dilution. Two drills are operating.

**Noranda Mines is nearing completion of a 50% expansion in its smelter capacity.** Additional capacity will be utilized for treatment of copper concentrate from new customers such as Willroy Mines, Coldstream Copper and Geco Mines. Both Willroy and Coldstream are now in production, while shipments from Geco are scheduled to start early in September. The smelter at Noranda handles about 35 other customers including Campbell Chibougamau, Opemiska, Quemont, Waite Amulet, Normetal, East Sullivan, and Sherritt Gordon.

**Opemiska Copper Mines is making excel-**


# Only KENNAMETAL* PX Rock Bits

## *have these four exclusive features to give you faster penetration . . . longer service life*

Each of these Kennametal features can mean savings to you:

- End milling the bit body to receive the carbide inserts eliminates the need for a center spacer
- Two short inserts permit two water ports to be located off-center where they will not clog.
- Setting the long inserts in two sections makes them stronger and lengthens bit life.
- "X" design eliminates rifling and speeds penetration by providing space for fast clearance of large chips.

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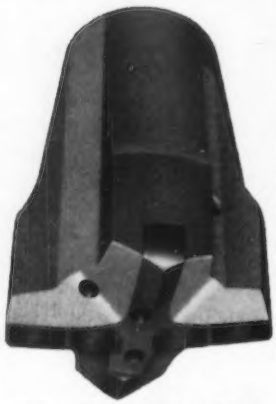

Sizes from 2½" to 5" are available in the "X" design. Call your Kennametal Representative or write KENNAMETAL INC., Mining Tool Division, Bedford, Pennsylvania.

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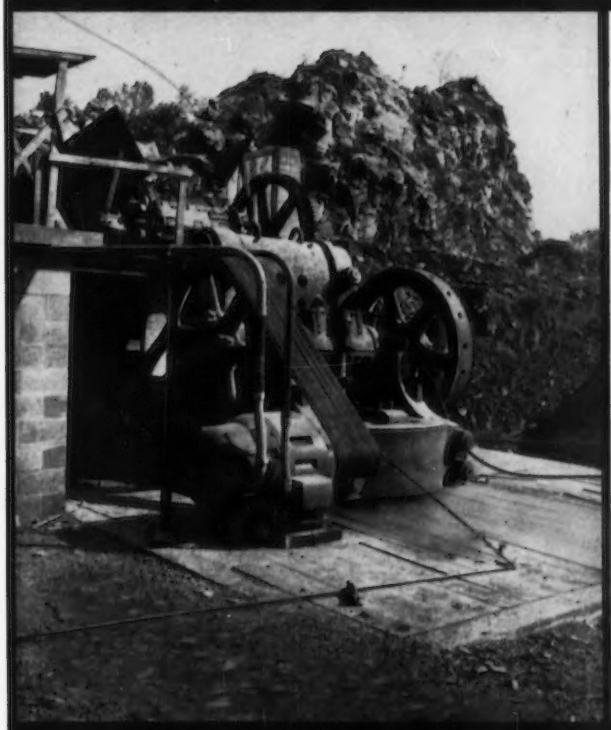

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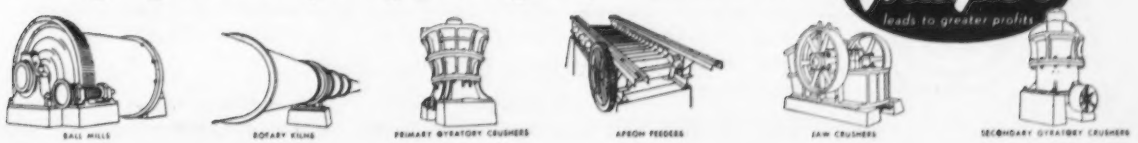
A Traylor leads to greater profits



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*helps to create headline products*

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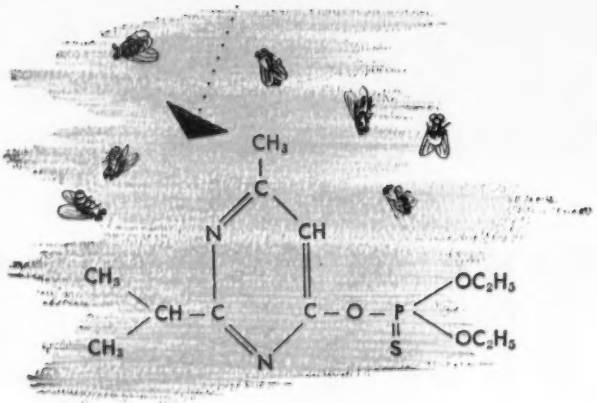
What a 'killer' this complex chemical is turning out to be! And quite impartial as to its victims: — houseflies, barnflies, fruitflies, aphids, mites, ants, beetles, chinch bugs, roaches, and many other pests that bother man and beast. It kills them dead!

As with the former chemicals which made such notable headway in man's fight to subdue these destructive pests, Sulphur is very much in the picture—here is one of the many variations of the benzene ring . . . the Diazinon Formula. That letter "S" tied in with the letter "P" discloses the all-important thiophosphate.

Sulphur, often called one of the Four Pillars of the Processing Industry, is benefiting mankind in many ways. None is more important than that of controlling crop-destroying pests.

**A product of the Geigy Chemical Corporation.*

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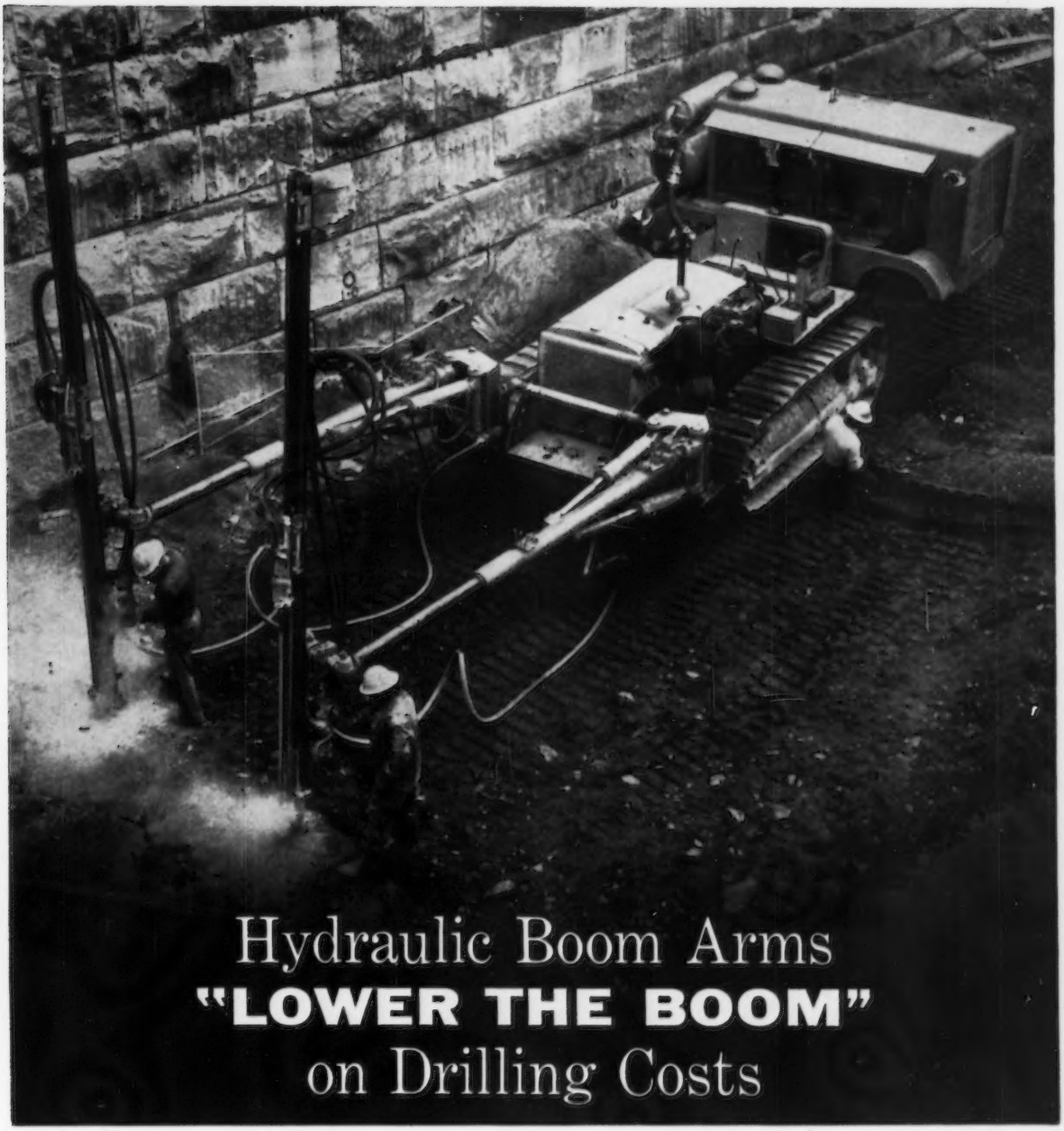

# Hydraulic Boom Arms "LOWER THE BOOM" on Drilling Costs

H-Booms have extra-capacity, double-acting hydraulic cylinders that retract and extend, swing or elevate in a hurry—yet pressures are moderately rated. There's no creeping or drifting! Boom can be extended 6 feet . . . that's an extra foot of length to afford better spacing of holes and greater area coverage without moving the rig.

Heavy-duty, Chicago Pneumatic H-Booms can be easily mounted on mine car, track or rubber-tired jumbos. It's a highly productive drilling unit when used on your old tractor. Write for more detailed information. *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, New York.*

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## Ontario *(Continued)*

**lent progress** in the expansion program now in progress on its Chibougamau area copper producer. The present production shaft is being deepened, while the Perry shaft, some 2900 ft to the east, is over half way to its initial depth objective of 2,325 ft. Another shaft is also in progress about 750 ft east of the No. 1, the main production shaft.

## MANITOBA

**Dalhart Minerals reports** that crushing and sorting of beryl from open pit operations on its Greer Lake property is underway. Beryl will be stockpiled until the company establishes its proposed chemical plant. Negotiations for a plant-site at St. Boniface are now in progress.

**Indian Lake Mines has acquired a 129 claim group** located 12 miles northeast of Moak Lake. Company will carry out magnetometer-EM surveys this year.

**New Goldvue Mines** is to carry out diamond drilling as a follow-up to geophysical surveys carried out last year on its nickel-copper prospect in the Moak Lake area.

**Montgary Explorations reports that cesium** has been encountered in spodumene cores at its Bernic Lake lithium development as a result of tests undertaken by American Metal Co. Massive pollucite containing up to 35.5% cesium has been encountered in five separate drill holes. As a result of the discovery all Montgary cores will be rechecked.

**New Manitoba Mining and Smelting Co.** is carrying out lateral work on both the 175 and 350 ft levels of the Cat Lake property. About 50 ft of ore has been opened up by drifting on the 350 level with grade reported better than the average indicated by surface drilling (0.33% nickel, 0.75% copper, and 0.06% cobalt per ton). Construction of a 1,000 ton mill to produce both a nickel and copper concentrate is expected to be completed before the end of the year. Company is considering erection of a small smelting unit to reduce the concentrates to matte form.

## BRITISH COLUMBIA

**Western Gypsum Products Ltd., Winnipeg,** a wholly-owned subsidiary of British Plaster Board (Holdings) Ltd. of London has acquired all capital stock of Westroc Industries Ltd. of Vancouver, and is also completing purchase of the bulk of the assets of Columbia Gypsum Co. Ltd., Windermere, B. C. and Spokane, Wash.

About $1-million is involved in each new acquisition.

Western Gypsum has mines at Amaranth, Man., and conversion plants at Winnipeg and Calgary. From Columbia Gypsum, Western acquired the major part of the vast Windermere deposits, said to be the largest on the continent and variously estimated at 5-million to 1-billion tons, and the finishing plant at Spokane. Westroc is the largest manufacturer of mineral insulation in Western Canada.

**Cowichan Copper Co. Ltd. will produce copper at a total cost, including provision for depreciation and pre-production write-offs of 17½c per lb.**

President O. G. MacDonald reports production plans call for an output of 500 tons copper a month. In the initial period, company will maintain an average grade of 5% millfeed. And when development of known lower grade ore bodies is deemed advisable it is planned to lower the grade of feed to 2% and to increase milling rate up to 1,000 tpd thus maintaining a monthly output of about 500 tons of copper.

Production cost price is based on information furnished by Cowichan's consultants on estimated mining and milling costs and assumes an average copper content of 5% in the initial operating period, a 25% copper concentrate, a one-for-five ratio of concentration, an operating rate of 400 to 500 tons of ore daily and a loss on U. S. exchange of 5c on the dollar.

**Jericho Mines Ltd., with 1,000 claims in the Highland Valley, reports that Phelps Dodge Corp. is investigating four important mineralized zones.** Jericho property virtually surrounds the Bethlehem property and is close to Trojan and


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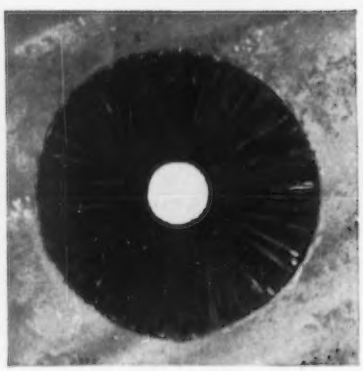

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Brunner & Lay carbide Rok-Bits in these body types—cross, chisel, "X", cutaway, taper socket. Furnished in standard wagon drill and hand held drill threads, also—600, 400, 200 and J-7.50 threads. Bit sizes up to 6½" in our Hole-Master. Write for FREE catalog #756.

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These special, more-costly but more-effective differentials are but one of the many reasons why you get more tractor-shovel when you buy a "PAYLOADER" . . . why they dig more, carry more and deliver more yards per day than any comparable size tractor-shovel. You also get no-stop power-shift transmissions, planetary final drives, power-steer, 4-wheel power brakes, hydraulic load-shock-absorber . . . and you get the exclusive "PAYLOADER" bucket motion with 40° tip-back at ground level plus powerful pry-out action.

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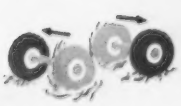

automatically direct the most power to the wheels that are gripping — whenever the other wheels tend to spin on mud, loose sand, ice, snow, etc.

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## Stainless steel prevents failure of fan blades in damp corrosive atmosphere

Warms air in winter! Cools air in summer!

That's how the system diagramed at the right improves working conditions in Inco-Canada's big Frood-Stobie mine.

In winter, the fan drives frigid outside air through sprayed water in two tremendous stopes at the 300- and 500-foot levels. The water freezes... gives up its heat to warm the air.

In the summer, the fan drives warm outside air over the glacier-like accumulation of ice formed during the winter. As the ice melts, it extracts heat from the air. Miners work in comfort year 'round.

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This big, 16½-foot fan operates continuously day-in, day-out in all weather. And that outside air it handles contains dust and traces of corrosive sulphur dioxide.

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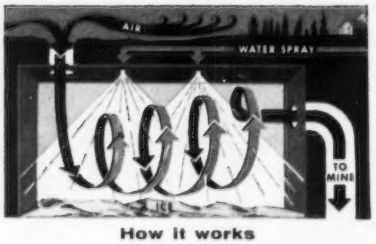
Nickel-containing stainless steel has the resistance to corrosion, erosion and fatigue called for in mine and mine building air-conditioning systems and in other mine applications. It gives you extra strength and toughness, too. And it's easy to fabricate.



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Consider stainless steel when you need long, reliable equipment performance and extra strength.

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## NICKEL ALLOYS PERFORM BETTER, LONGER

## B.C. *(Continued)*

Salmo Prince properties.

With Phelps Dodge assuming all operating costs, the U. S. company (at the end of five years development work and providing the property is put into production) has an option to purchase Jericho's 25% interest by payment of 25% of the net earnings over 10 continuous years of operation.

**Against a background of uneasiness in British Columbia's mining picture because of fading trade deals with Japan, threatened United States import duties on Canadian lead and zinc, and depressed copper prices,** Premier W. A. C. Bennett announced in Victoria that it "looks more favorable than ever" that a steel smelter will be established soon in the Kootenay area of the interior section of the province.

His announcement came following meetings in Trail with officials of Consolidated Mining and Smelting Co.

A basic iron and steel industry in the interior would not hinder establishment of a smelter on the coast, he said. Iron ore for the proposed steel smelter in the Kootenays would come from a second reserve of tailings from the Cominco operations. This ore has had the sulphur removed in the Cominco fertilizer plant and is suitable for making steel, the premier said.

And on the lower mainland, spokesmen of Western Canada Steel Ltd. confirmed their company was proceeding with its development on 140-acre Twigg Island on the mouth of the Fraser River near New Westminster which envisages construction of a smelter "within five years."

Western Canada Steel has already started the first stage in the project which is preparing the island for the erection of a $2-million steel ingot plant with 100,000 tons capacity as the first major step towards construction of the steel smelter. Company spokesmen said that as soon as bridges are completed to the island they will proceed with building the ingot plant.

# IN LATIN AMERICA

## BRAZIL

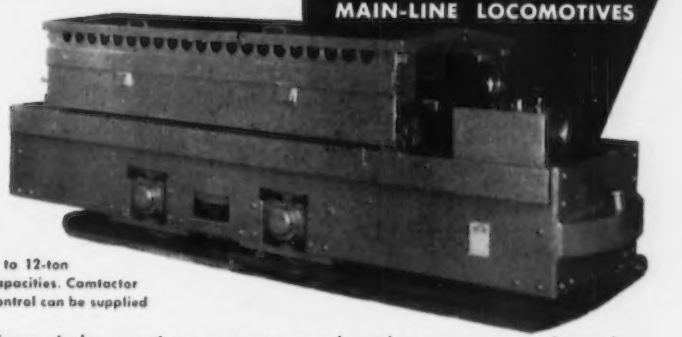
**Brazilian exports of minerals** in 1956 reached an all time high, representing 3.2% of over-all exports compared with 2.6% the year before. Value of the exports increased from $25-million to $35.4-million with the biggest buyer being the U. S.

Sales to the U. S. increased by 40% last year over sales in 1955, but sales to some other countries fell off. Biggest dollar-earning items in the increased exports were: iron ore, $15.4-million (1955—$1.2-million); manganese, $7.3-million (1955—$4.4-million); tungsten, $5.7-million (1955—$3.2-million); mica, $3.1-million (1955—$2.7-million).

This year's minerals dollar earnings


LOW COST HAULAGE

ATLAS TYPE A
MAIN-LINE LOCOMOTIVES



3 to 12-ton capacities. Camtactor control can be supplied

Type A locomotives are powered with two motors through double reduction spur gear drives to each axle. You get full drawbar pull . . . extra payload. Investigate today the ton-mile economies awaiting you with Atlas locomotives.

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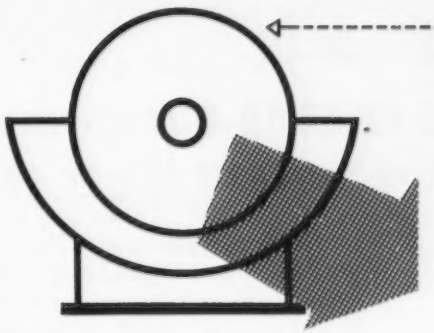

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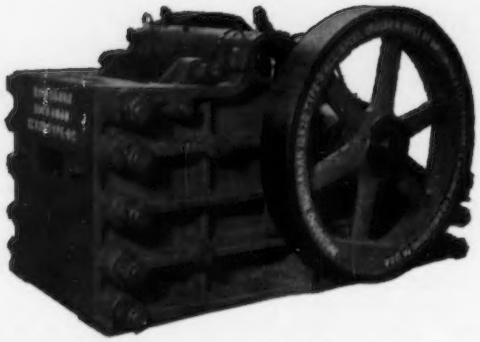
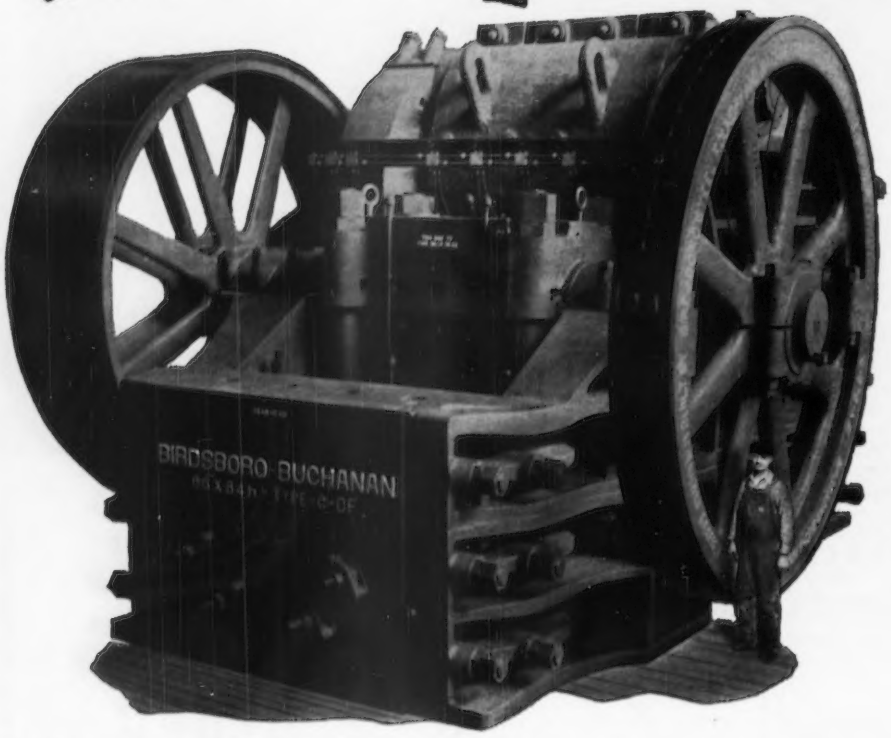


*12" x 20" four-piece frame type*




*66" x 84" type C-DF (patented)*

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In any size from the smallest to the largest ever built, there's a BIRDSBORO-BUCHANAN all-steel jaw crusher to meet your specific crushing requirements on any type of rock or ore produced. See what BIRDSBORO engineers can do to help improve your crushing operations. Call or write us today at Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa. *District Office:* Pittsburgh, Pa., *Subsidiary:* Engineering Supervision Co., 120 W. 42nd St., New York 36, N. Y.

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With or without automatic operators . . . and despite a heavy concentration of grit in the slurry . . . DeZurik Plug Valves shut off tight! And they open easily—without lubrication!

They're the *only* plug valves with resilient-faced plugs and eccentric action! In DeZurik Valves, the plug is pivoted eccentrically—backing away from the seat with the first fractional opening movement. There is no friction between the plug and the body; no sticking or jamming—no need for lubricants—just an easy quarter-turn from wide open to dead shut!

Closing the valve presses the resilient-faced plug against the seat—sealing *around* sand or grit lodged on the seat.

(DeZurik Valves have an effective life three-to-four times that of ordinary valves on a service which requires 100% seal *with 25-60% sand in the slurry!*)

Resilient plug facings also resist abrasion from solids in the flow, delivering longer life with less maintenance.

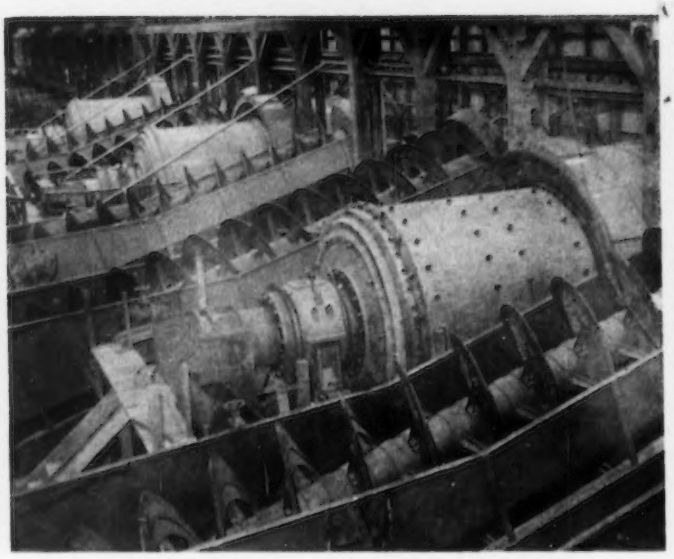
**Get more information on DeZurik Plug Valves. Representatives are in all principal cities; or write to**

DeZURIK CORPORATION
SARTELL, MINNESOTA

# see what Marcy can do for YOU!

## Marcy Engineering Helps Increase Efficiency and Production at Atlas Consolidated

Atlas Consolidated Mining and Development Co., Island of Cebu, P.I., recently completed installation of the three 10' x 10' Marcy Grate Discharge Ball Mills shown in photo. In addition they have ten No. 86 Marcy Grate Discharge Ball Mills. These mills were engineered and manufactured by Marcy; and sold and serviced by Marcy's representative, Edward J. Nell Co., Manila.



Over the past years the foresight of Colonel Andres Soriano, President, and the staff of Atlas Consolidated Mining and Development Co., has paid off in greatly increased production of base metals. This increased production has been made possible by their aggressive planning . . . including the addition of larger diameter Marcy Ball Mills, which resulted in increasing the operating efficiency. Also, the ten No. 86 Marcys, after many years of operation, have been modernized . . . again with the purpose of increasing efficiency. The present grinding capacity of this plant is now 13,000 to 14,000 tons per day.

***This is another example of how Marcy engineers have played an important part in helping a company in expanding its facilities and increasing efficiency . . . you, too, can have the advantage of this experience. Write, wire or call.***

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## Brazil *(Continued)*

are expected to be considerably over last year's with stepped up production in manganese coming from the Bethlehem-Icomi works in Amapa. Brazilian government is also studying a plan whereby iron ore will get preferential treatment in exports and foreign investments to encourage the big mining companies to enter this section of Brazilian mining.

### U. S. Imports From Brazil

| | 1956 | 1955 |
|---|---|---|
| Crystal | 1,139,100 lb | 895,200 lb |
| Mica | 2,080,500 lb | 1,962,500 lb |
| Diamonds | 15,900 kg | 35,500 kg |
| Iron Ore | 1,223,000 m.t. | 1,010,100 m.t. |
| Manganese | 473,030,800 lb | 276,241,000 lb |
| Tungsten | 3,853,700 lb | 2,458,800 lb |
| Beryllium | 5,214,400 lb | 3,470,400 lb |
| Columbium | 160,400 lb | 233,000 lb |
| Tantalite | 140,000 lb | 221,800 lb |
| Zirconium | 661,400 lb | 3,097,200 lb |
| Unspecified | 273,549 lb | 2,970,700 lb |

## CHILE

**Japanese Corp. of Mitsubishi is interested in developing** high-grade iron properties in Chile, and to that effect, several of its mining engineers and geologists have made Copiapó their headquarters; and in the next month, will start drilling one property located some 20 miles NW of Copiapó near the Cerro Imán high-grade magnetite mine.

**President Señor Ibañez has declared emphatically that Chile will not reduce its present rate of copper production** of 507,000 short tons of copper per year obtained from the three U. S. owned mines. He also mentioned that the fall of the price of the red metal will mean to Chile a decrease of some $40-million in its dollar income, and that since the country's cost of producing copper is around 18c per pound, he thought Chile will be able to hold its own and sell its copper in the world's markets. Finally, he derided the possibilities of selling copper behind the Iron Curtain.

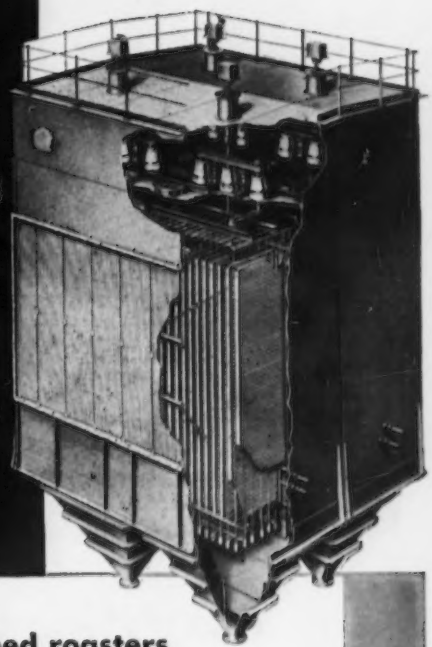
**To reduce the cost of loading the high-grade iron ores** which are being exported to the U. S., Western Germany and other European countries, several shippers are building mechanized wharfs at the small ports of Caldera, Chañaral, Flamenco and Locitas. At this last location, the wharf is being built by Krupp.

**National Smelter Corp. has decided to revise its decision** to build, at the small port of Papudo, Aconcagua province, the new 400 tpd copper smelter and 36,000 tons a year electrolytic refinery. To that effect it has recalled to Chile Frederick S. Mallet, an expert on air pollution from San Francisco, to consult his opinion on the three most favorable sites considered for the smelter and the refinery. New smelter will handle the whole of the output from the central provinces of Santiago, Valparaiso and Aconcagua.

## COLOMBIA

**Complete freedom of exports and free use of dollars earned from exports has been decreed for the Colombian mining**


Over 200 RESEARCH-COTTRELL PRECIPITATORS Collect Dust and Fumes from Metallurgical Sources Including:



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## Colombia *(Continued)*

**industry, except gold, silver, and platinum.** Regulation puts the extractive industry of base minerals on the same footing with the oil industry for the next 30 years. It affects coal, sulphur, cement and any other minerals that will be developed under the new plan, which may include asbestos.

Already several U. S. mining corporations have registered in Colombia and have only been waiting for this new legislation to help them develop mineral deposits. Exploration work by AS&R, for instance, may now start at an early date as the company is ready for such operations. Observers believe that the new regulation will bring great benefits to Colombia in opening new export fronts.

For the precious metal industry a special statute is being worked out that will make the companies sell gold, silver and platinum to Banco de la Republica. Mechanics of the arrangement have not been worked out so far.

## MEXICO

**Altos Hornos de Mexico, S. A., Mexico's largest steel mill, is rapidly developing an iron ore property** in the State of Chihuahua.

About 18 months ago, Altos Hornos purchased two deposits, La Perla and La Negra, from La Consolidada, a United States controlled manufacturer of steel products.

Altos Hornos immediately mapped out an integrated expansion program for its steel mills at Monclova, Coahuila. The integrated program includes development of the iron ore properties and expansion of the steel plant itself—financed by a $16-million loan last February from the Export-Import Bank—construction of a 160-mile railroad from the company's own funds and, later, a coal mine owned by the company will be developed with the aid of a $12½-million loan of August 1956, by the French National Bank for Commerce & Industry.

Development of the iron property includes construction of a crushing plant with a capacity of 500 metric tons an hour, a heavy media plant and general exploitation of the mines through benches.

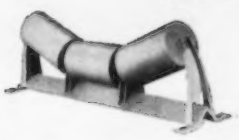
Here is the equipment lineup thus far as reported by Altos Hornos' Mexico City offices in mid-August:

Allis-Chalmers is supplying two gyratory crushers; Western Machinery Co. has designed and is supplying equipment for the heavy media plant; Athey Products Corp., four 31-ton dump trucks with Caterpillar diesel engines; Fairbanks-Morse, two 750-kw diesel-electric plants; Chicago Pneumatic Tool Co., one 650 cubic foot air compressor; Jeffrey Manufacturing Co. is furnishing most of the conveyor belt system; two Bucyrus-Erie 2½-yard shovels with Caterpillar diesel engines.

The standard gage 90-lb-rail railroad which Altos Hornos is constructing will connect the District of Camargo, where the mines are located, with El Oro, 110 miles southeast, and with Falomir, 50

# MATCH IDLERS TO THE JOB

## ...LINK-BELT can meet your specific load and capacity requirements

| IDLER SERIES | TYPE OF IDLER DUTY | TYPICAL APPLICATIONS |
|---|---|---|
| **NEW 50**  | General duty conveyor<br>• for maximum loads of 100 lbs. per cubic foot<br>• for moderate lump sizes | Designed for conveyors carrying medium loads or for installations requiring intermittent operation. |
| **100** | "Round-the-clock work horse"<br>• handles all but the heaviest and coarsest materials | Coal, coke, sand, gravel, iron ores, sinter, taconite, potash. |
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**LINK-BELT SERIES 100 IDLERS** on this 42-in. wide, 218-ft. long belt conveyor carry 800 tph of ore from primary screens to stock pile.

### TO TRAIN YOUR BELTS for proper operation . . .

**BELT TRAINING IDLERS** Left, positive action type trains and protects single direction belts. Actuating disc type at right is best for reversible conveyors. Self-aligning idlers of both types are also available for return run.

**RETURN BELT IDLERS** support the empty belt on the return run.

### TO PROTECT THEM IN SERVICE

**TROUGHED RUBBER CUSHION IDLERS** (right) absorb impact under loading points, when large lumps and heavy materials are loaded on belt. Rubber tread return idlers, at left, simplify handling of tenacious materials.

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WHETHER you handle cottonseed or coal—Link-Belt makes the exact size and type of belt conveyor idler you need. For top performance . . . lowest per-ton handling cost—see your nearby Link-Belt office or authorized stock-carrying distributor. Ask for Data Book 2416.

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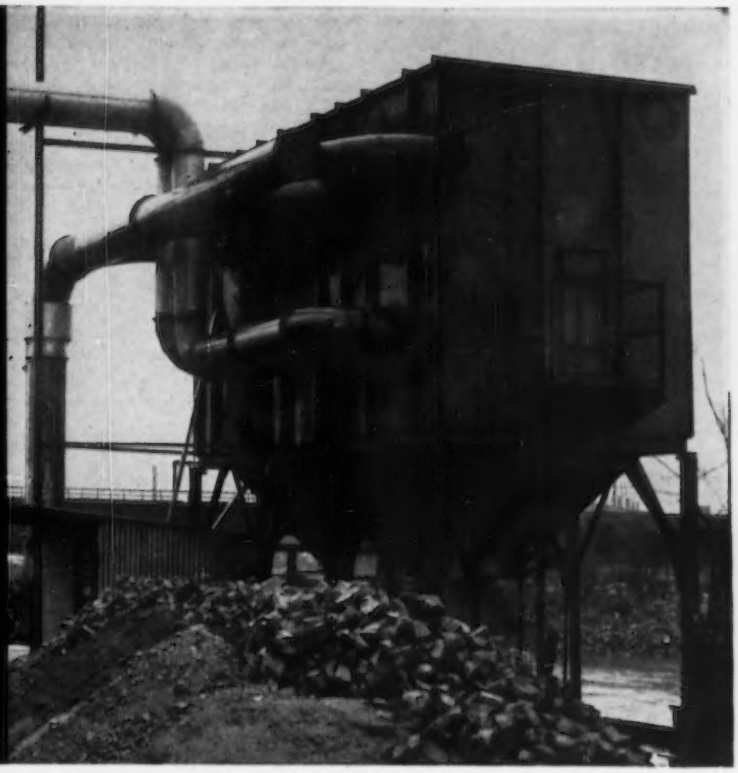
# WHEELABRATOR DUSTUBE® COLLECTOR performs king-sized filtration job



## ventilates a dozen operations, salvages salable material at Chromium Mining & Smelting Corporation

At the Riverdale, Illinois plant of Chromium Mining & Smelting Corp., the metals that come from its smelting plant are processed and blended. The products made are ferro-chrome, ferro-silicon, and ferro-manganese alloying materials.

All of the various processing operations — crushing, screening, conveying, weighing, container filling and drying — are dust producers. This finely divided metal dust is salable; therefore, recovery is desirable.

To provide required ventilation at these processing stations and also to recover the dust created, a Wheelabrator Dustube Collector is used. This high efficiency cloth tube type collector has three compartments. One of these ventilates the raw materials operations, the other two collect dust and fume from weighing, elevating, mixing, can filling, and drying operations.

The ventilating air is carried by ducts to the Dustube Collector where the dust is filtered out and reclaimed. This saves money as well as keeps the atmosphere clean throughout the shop area.

Consistently registering collection efficiencies of more than 99%, Dustube Collectors are the answer to dust and fume problems in mining and metallurgical operations. Special fabric tubes that withstand heat and corrosion enable this bag-type dust collector to provide similar efficiencies in smelting and sintering.

**Wheelabrator Dustube Collectors used for these applications:**

Electric Refining and Casting Furnaces
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To learn how Wheelabrator Dustube Collectors are able to recover valuable material, improve working conditions and better community relations, write today for a copy of the fully-illustrated, fact-packed, Catalog No. 372-C.

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CORPORATION
438 South Byrkit Street, Mishawaka, Indiana

## Mexico *(Continued)*

miles northwest. In mid-August, 40 miles of the line toward El Oro had been completed.

It was decided to exploit first La Perla, the larger of the two mines. In La Perla, 40-million metric tons of ore have been proven. In La Negra, exploration crews proved up 9-million tons just to get an idea of what was in the deposit and stopped exploring. La Negra will not be worked until Altos Hornos is through with La Perla, which the company estimates will be in about 25 years.

Ore is hematite. Analysis reportedly indicates 62% iron, high silica content, low phosphorus content and an amount of sulphur which is not "too high."

Development of La Perla will keep pace with the construction of the railroad. Altos Hornos hopes by the end of June 1958, to begin sending 1,000 metric tpd of milled iron ore over the railroad to the steel mill and to build up gradually until it is shipping 2,000 tpd by the end of 1962.

# IN AFRICA

**U. S. Steel Corp., together with other U. S. and French mining interests, expects to raise about $67-million** this fall to finance the exploitation of a rich manganese deposit in French Equatorial Africa. Combine, known as La Compagnie Miniere de l'Ogooue (Comilog) plans an 80-km aerial tramway from the mine to the proposed 280-km railroad for the final haul to Pointe Noir on the coast.

Mine will be in production by mid-1958 with some 500,000 ton output the first year. Eventually, they plan to raise output to about 800,000 tons per year.

Participants with U. S. Steel are the French semi-public Bureau Miniere de la France d'Outre-Mer (22%); Compagnie de Motka et Hadid (15%); and La Compagnie Miniere de l'Oubangi Orientale (14%). U. S. Steel holds 49% interest and will claim 49% of the output.

**Work has begun on stripping a second open-cast copper pit** at Nchanga Consolidated Copper Mines in Northern Rhodesia. New pit's published reserves total more than 2-million tons of high grade ore running at about 7% cu. First copper from new pit is expected to be produced in 12 months.

**Consolidated African Selection Trust Ltd.** is prospecting for diamonds in Southern Rhodesia. Company is engaged in intensive prospecting at Samabula, about halfway between Bulawayo and Salisbury.

**Rich copper reefs, some assaying 12 to 14% Cu,** have been discovered by Capricorn Minerals Ltd. of Southern Rhodesia, in the Odzi-Sabi area on the eastern border of South Rhodesia. Odzi-Sabi mineral belt contains a wide variety of minerals, and Anglo-American Corp. of South Africa Ltd. has pegged 26 blocks of claims in the area.

**Southern Rhodesia may be the biggest producer of high-grade metallurgical chrome in the free world by the end of 1958.** Southern Rhodesia's Treasury Minister, Cyril Hatty, told Parliament that the territory's chrome production now exceeds 600,000 tons and is expected to reach 1.2-million tons a year by the end of next year.

Hatty said the value of Southern Rhodesia's mineral output this year is expected to be in the region of $75-million. He said one of the pleasing features of the mining year in Southern Rhodesia had been the great prospecting activity of mining groups from the North American Continent, the U. K., Europe and the Union of South Africa.

**Two new deposits of columbium-yielding pyrochlore** have been discovered in the Southern Province of Nyasaland in Central Africa. There are now four known pyrochlore deposits in the south of Nyasaland.

**Western Deep Level Mines Ltd. has started shaft sinking** on their $20-million gold mining project 35 miles west of Johannesburg. Mine is a joint effort of Anglo-American Corp., Central Mining & Finance and New Consolidated Gold Fields, with Anglo-American to manage the property.

Western Deep will be the first deep


# in the heart of the jungle

Acker Hydraulic Feed Teredo Trailer Mounted Diamond Core Drill drilling for chrome ore deposits deep in the Jungles.

This trailer mounted Acker Teredo Diamond Core drill is hard at work locating and proving chrome ore bodies deep in the heart of a tropical jungle. The operators know from past experience that Acker builds rugged dependability into every drill—yet, essential elements are so light and compact that they can be carried by plane or mule-back.

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But savings in time are only part of the Naylor economy story. The extra strength of the Naylor structure permits the use of lighter gauge material at lower cost, without sacrifice of performance. The larger the diameter, the more this is true.

**For full details, write for Bulletins No. 507 and No. 514.**

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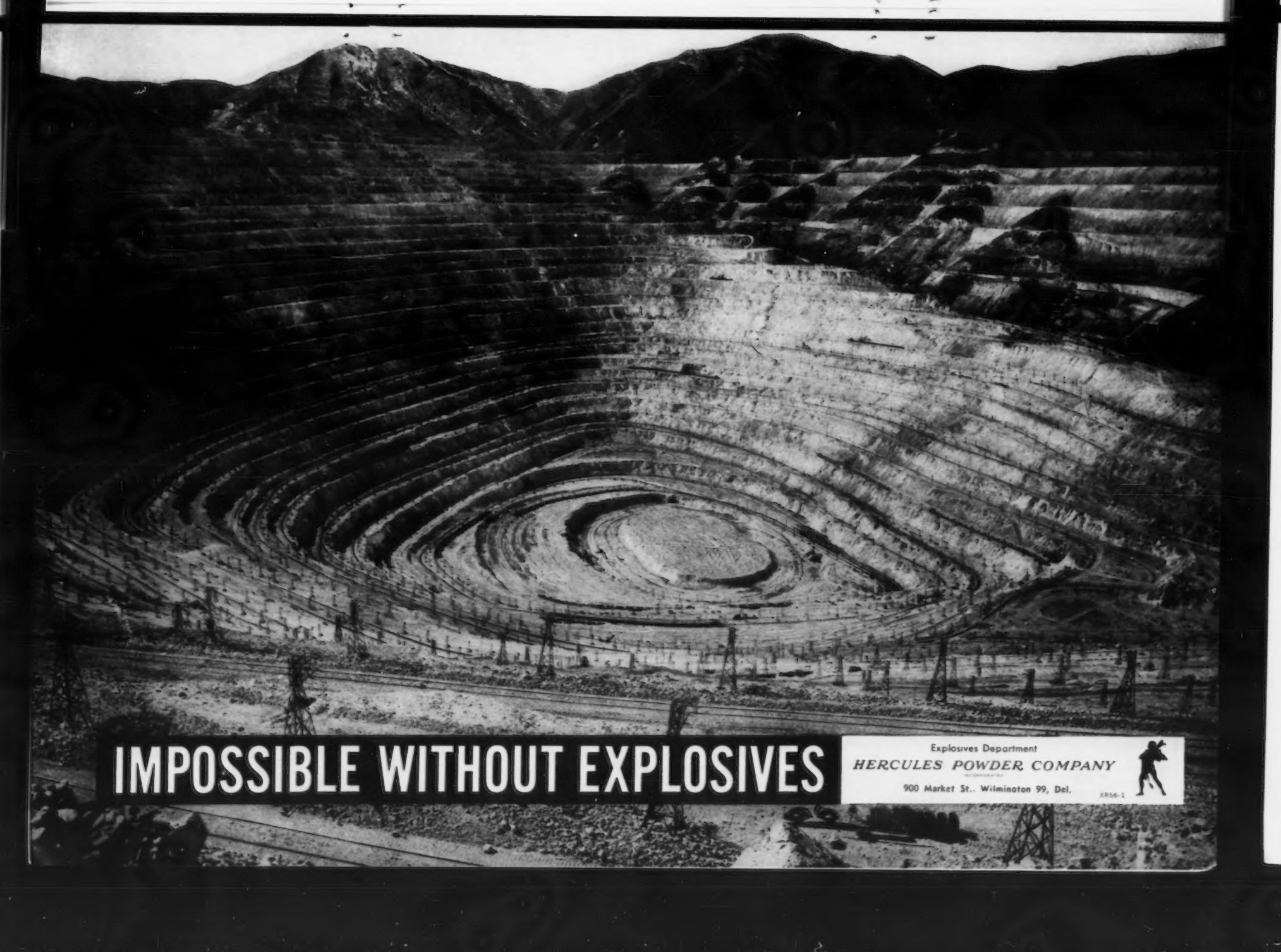
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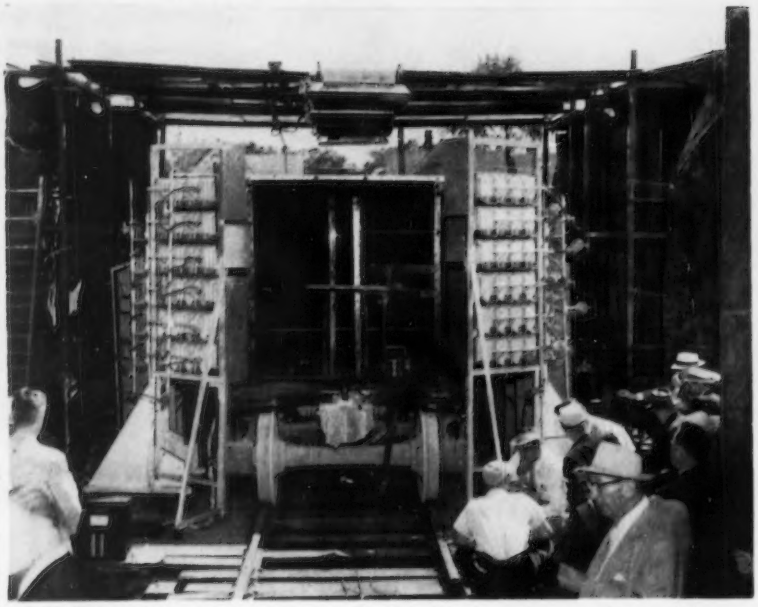
**Africa** *continues p. 218*



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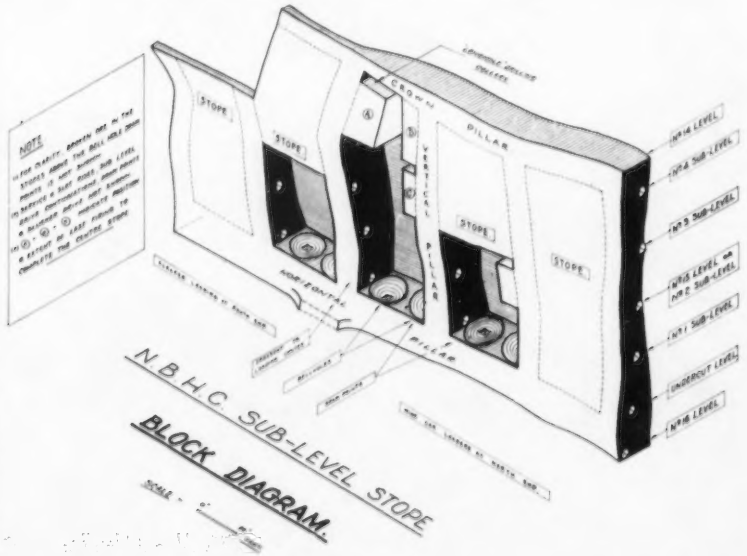
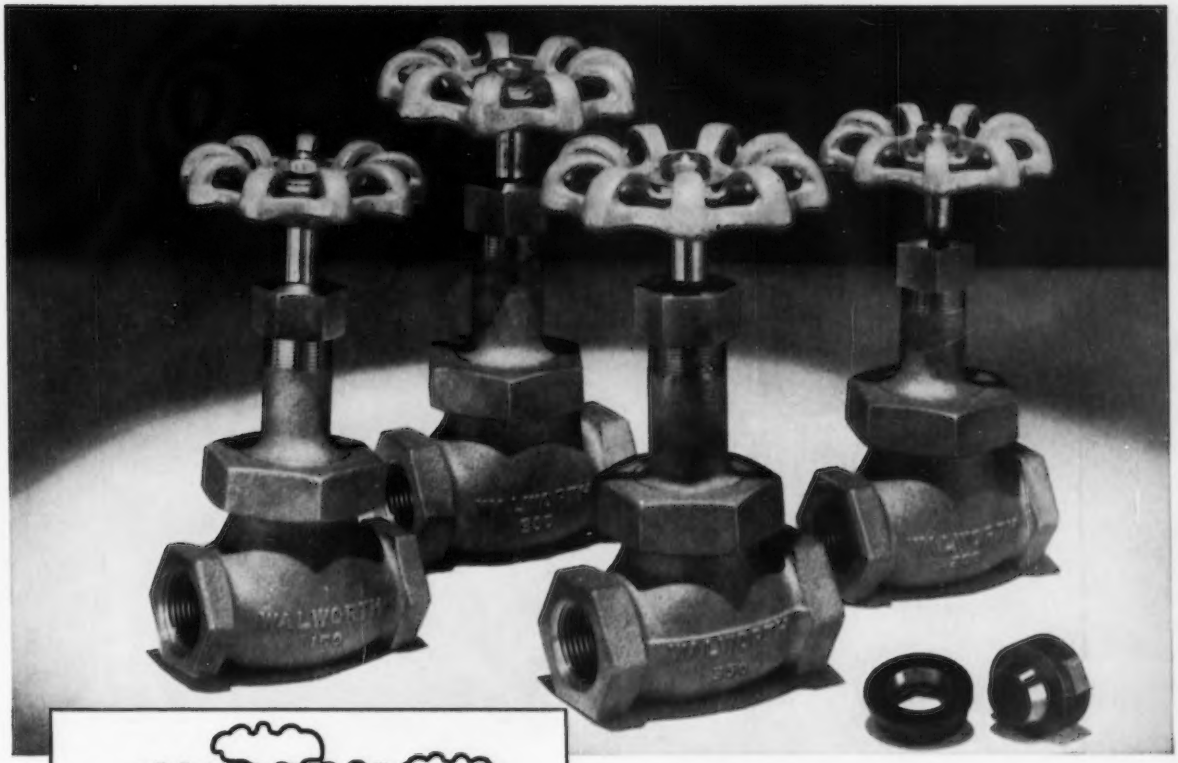
## New Method Uses Infra-Red to Thaw Ore Cars

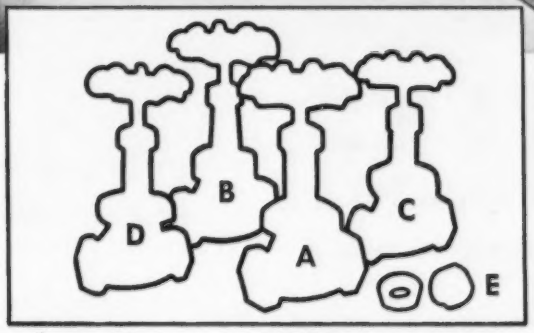
FASTER AND CHEAPER THAWING OF ORE and coal in northern climes is promised by Perfection Industries Division of Hupp Corp. with introduction of the German-invented Schwank infra-red generator, demonstrated last month in Cleveland, Ohio.

Before a large group of shipping, steel and mining representatives an 80-ton DM&IRR ore car was frozen to a 6- to 8-in. thickness on all sides and dumped within minutes after being treated with the infra-red heater bank. Perfection manufactures the generators, named after their inventor Guenther Schwank, and notes one installation operating currently at Anaconda's Butte, Mont. operations.




**LARGEST SINGLE FIRING** in the history of Broken Hill mining area, Australia, took place recently in New Broken Hill Co. Ltd.'s trial sublevel stope. About 13,000 long tons were broken, completing blasting in the central stope. Total of 137 holes were drilled and two days were required to charge the holes with a total of 156 cases of 1½-in. AN60 explosive. Fragmentation was good, and effects of such an underground blast were negligible.




**A** — No. 225P.....350 WSP 550F, 1000 WOG
**B** — No. 260P.....300 WSP 550F, 600 WOG
**C** — No. 245P.....200 WSP 550F, 400 WOG
**D** — No. 237P.....150 WSP 500F, 300 WOG
**E** — "500 Brinell" Stainless Steel Plug Type Seat and Disc

Walworth offers four lines of Bronze Globe Valves with stainless steel, plug-type seats and discs. Advantages of these valves include:

• **Stainless Steel Plug-Type Seats and Discs,** heat-treated to a minimum of 500 Brinell hardness reduces wire-drawing to a minimum. Seats and Discs are machined and fitted simultaneously, assuring perfect mating.

• **Deep Stuffing Boxes with Glands** are fitted with reinforced, molded packing. Valves can be repacked under pressure when fully opened.

For Longer Bronze Valve Life . . .

## "500 BRINELL" PLUG-TYPE STAINLESS STEEL SEATS AND DISCS

**150 lb. 200 lb. 300 lb. 350 lb.**

• **Oversize Stems,** made of high tensile strength silicon-bronze, assure long life.

• **Rugged Body Hexes,** are flat on top; do not interfere with wrench gripping body-to-bonnet union ring connection.

• **Bodies,** made of Composition M bronze (ASTM B61), have ample wall thickness to provide high safety factor.

• **Patented Handwheels** are air-cooled and designed with a "finger-fit grip." Makes turning easy even when wearing greasy gloves.

• **Identification Plates** secured by lock-washer under stem nut, show Figure Number of valves and make re-ordering sure and easy.

*FOR COMPLETE INFORMATION, SEE YOUR WALWORTH DISTRIBUTOR OR WRITE FOR ILLUSTRATED CIRCULAR*

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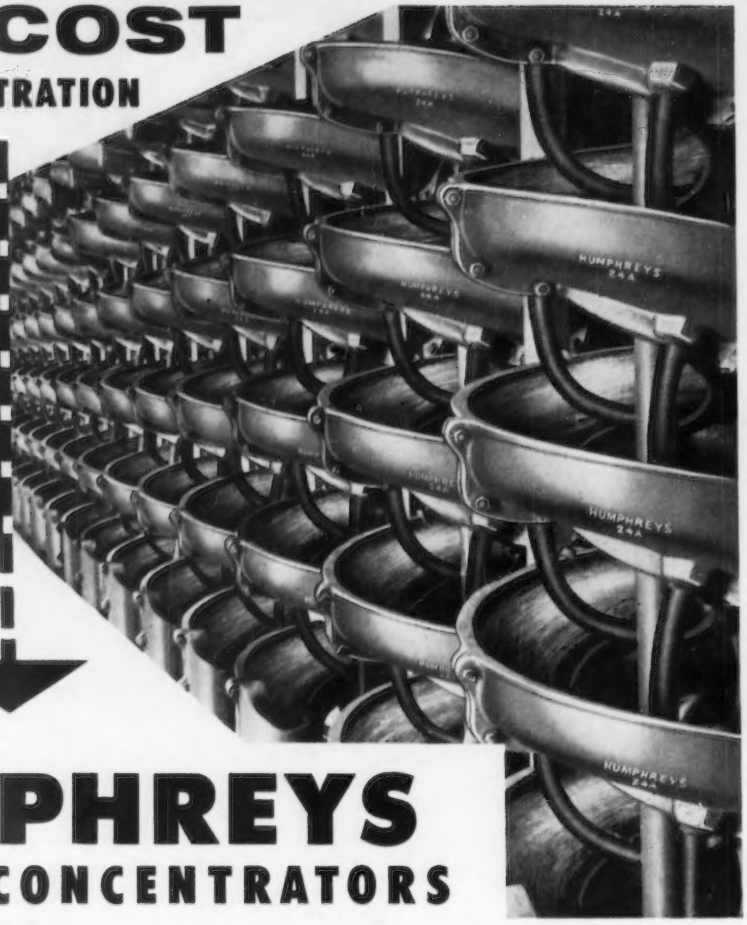


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## SPIRAL CONCENTRATORS

**HAVE ECONOMICALLY RECOVERED THE MINERALS LISTED ABOVE**

Low cost concentration becomes a reality when you install Humphreys Spirals. Economy-minded mineral producers the world over prize these efficient concentrators, their economical installation, low maintenance costs and year-round trouble-free operation. No moving parts. Small floor space.

**APPLICATIONS:**

Production of a finished concentrate.

Production of a bulk concentrate of several minerals and a finished tailing in one or more stages.

Scavenging the tailing from another process for the recovery of heavy minerals.

*Write today for information on metallurgical tests of your ore samples for spiral treatment.*

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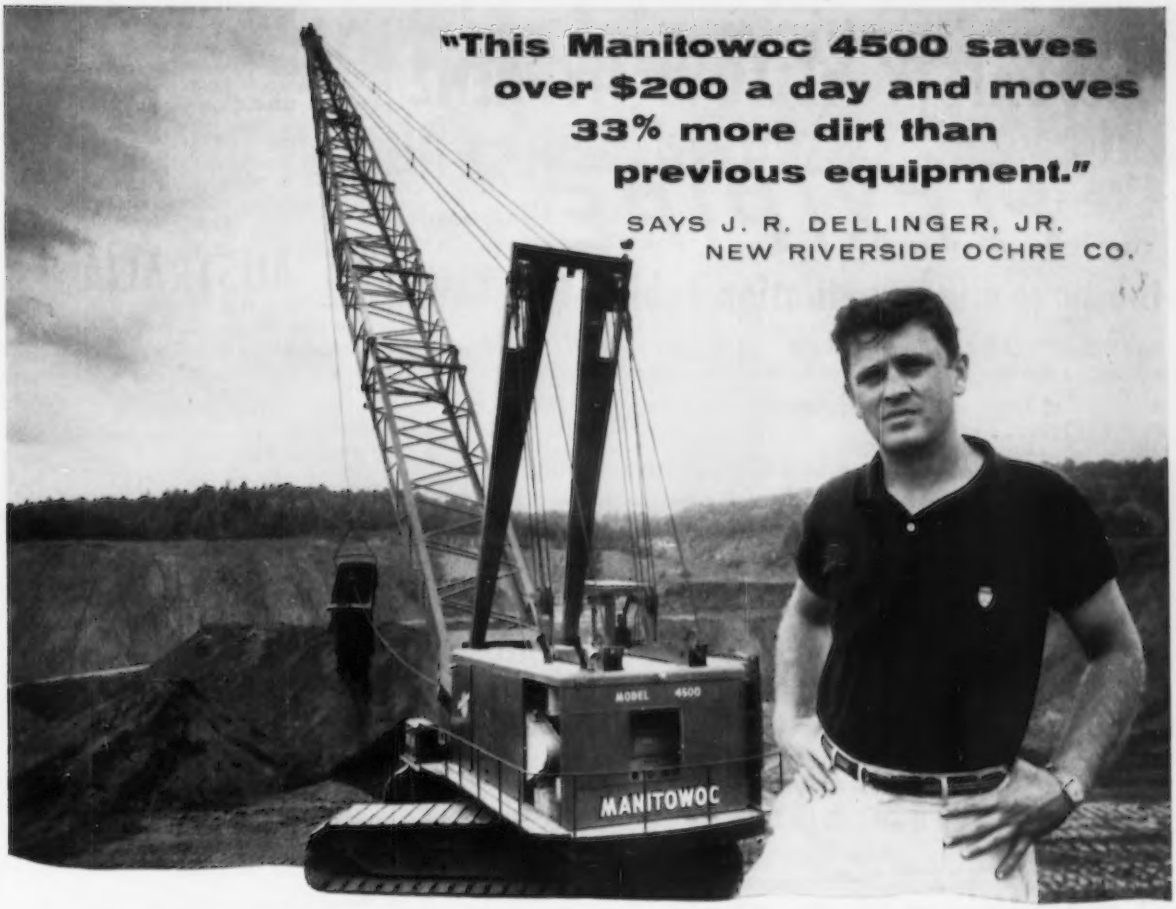
"This Manitowoc 4500 saves over $200 a day and moves 33% more dirt than previous equipment."
SAYS J. R. DELLINGER, JR.
NEW RIVERSIDE OCHRE CO.
MODEL 4500
MANITOWOC

The New Riverside Ochre Company, Cartersville, Ga., increased the output of barite ore by one-third after putting a Manitowoc 4500 dragline to work in the company's open pit mine. "In addition, the 4500 easily saves us $200 a day in labor and operating costs," says Mr. James R. Dellinger, Jr., partner in the operation.

### 2400 Yds. per shift

The overburden runs between 30' and 65' deep. Equipped with a 140' boom and 4½-yd. bucket, the 4500 first strips the overburden then excavates and stockpiles the ore for weathering. A week later the ore is shovel-loaded into trucks for washing and breaking. Present output is running about 2400 yards per 8-hour shift. Before the Manitowoc 4500 came on the job, output was limited to 1600 yards each shift, excavated by two shovels — a 1½-yd. and a ¾-yd. unit.

### Saves $200 a day

Use of the big 4500 has cut labor and operating costs by more than $200 a day. The drag handles a yard of dirt for 7 cents, compared to the 25 cents a yard with the old, two-shovel method — a saving of $230 a day, *plus* the increase in production! With the ore running 75 to 100 feet deep, the Manitowoc's lower cost per yard of material moved allows the company to mine at extreme depths and still show a profit.

### Selective Mining Possible

Because of the Manitowoc's long reach and accurate control, selective mining is now possible — casting off the overburden to one pile and ore-bearing earth to another. Thus, the grade of ore obtained from "spotty" areas intermingled with overburden is improved. The shovels used previously could not economically reduce the amount of dirt mixed with ore.

### Single Power Package

The Manitowoc 4500 offers big capacity with all the advantages of a single diesel power package. You get greater simplicity, more efficient utilization of power and more mobility. Unit drive eliminates involved electric motors, control boards, miles of wiring and the deadweight and wasted space this equipment requires. There's no restrictive cable dragging from the machine to prohibit mobility . . . no expensive power installations anywhere. The 4500 follows the ore to any spot on your mine.

There's much more to the profitable Manitowoc 4500 story. See your Manitowoc distributor for complete information on this amazing mining machine!

**MANITOWOC ENGINEERING CORP., MANITOWOC, WIS.**

SHOVELS
1-5½ YD.

Manitowoc

CRANES
20-100 TON

Use SAFETY YELLOW NYPRENE

FLEXIPIPE®

the new mine ventilation tubing by BEMIS

SAFETY YELLOW reflects the light . . . it is readily visible in darkness . . . minimizes damage from punctures by machinery and equipment.

And look at these additional important values you get in Bemis Nyprene FLEXIPIPE . . .

- Featherweight—fast, easy handling saves labor costs.
- Resistant to acid mine water, oil, grease, abrasion.
- Mildew proof—will not rot even if stored wet.
- Stores compactly—requires small warehouse space.
- Tremendous tear and tensile strength.
- Long life at low cost, with minimum maintenance.

Bemis also offers you Jute-grade FLEXIPIPE and Heavy-duty FLEXIPIPE. All three grades available with Bemis Rope Seam Suspension *at no extra cost.*

**Write or wire for full information about Bemis FLEXIPIPE**

**Bemis** BEMIS BAG CO.

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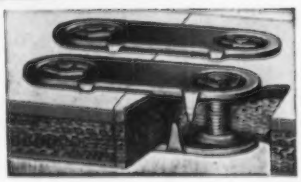
BELT FASTENERS and RIP PLATES

FOR HEAVY CONVEYOR AND ELEVATOR BELTS OF ANY WIDTH

★ FLEXCO Fasteners make tight butt joints of great strength and durability.
★ Trough naturally, operate smoothly through take-up pulleys.
★ Distribute pull or tension uniformly.
★ Made of Steel, Monel, Stainless, Everdur. Also Promal top plates.
★ FLEXCO Rip Plates are for bridging soft spots and FLEXCO Fasteners for patching or joining clean straight rips.



*Compression Grip distributes strain over whole plate area*

*Order From Your Supply House. Ask for Bulletin F-112*

**FLEXIBLE STEEL LACING CO.,** 4635 Lexington St., Chicago 44, Ill.


## Africa *(Continued)*

level mine to receive direct government tax assistance. Reduction plant capacity will be 100,000 tpm.

**South West African Diamond Corp. of Canada** has Atomic Energy Board permission to prospect for uranium on its Warmbad district diamond concession.

# IN AUSTRALIA

**The state of the rutile market** is being blamed for new orders to curtail the output of rutile in Australia. McGraw-Hill World News' Australasian Bureau understands that the price structure has practically collapsed and that offers of rutile at greatly reduced prices have failed to attract any bids.

At least five producers have ordered the curtailment of production and at least six others are expected to follow in the very near future. Experts believe that a number of companies will shortly suspend operations. These are the companies without any long-term contracts for the sale of their products.

Number of rutile producers in Australia rose within one year from 13 to 29. Current offers at below $90 per ton are failing to attract buyers who claim that they have overbought on their long-term contracts.

Australian mining experts predict that a difficult market will continue for at least 10 months and that renewed buying of ore late in 1958 will nevertheless fail to stimulate the prices.

**Samples from drilling and shaft sinking** over half the Capel area (Western Australia) of Westralian Oil Ltd. indicate more than 2-million tons of mineral concentrates. The concentrates contain 92% ilmenite with a titanium dioxide content of 56.1%. Titanium dioxide content of 1.3-million tons at Yoganup assays 61.9%.

**Cable Ltd. has three electro-magnetic separators in operation** at the Bunbury extraction plant and ilmenite output rate is now 1,100 tons a week. Further equipment is in the course of installation to obtain additional increase in output.

**Wittenoom Gorge project in Western Australia,** which is operated by Australian Blue Asbestos Ltd., is being greatly expanded and a new crushing and treatment plant are being constructed. Completion is expected in March-April 1958, when the plant's capacity will reach 25,000 tons a year. About half of this quantity will go to the U. S. while the remainder will be sold to Japan, India and Europe.

# IN THE PHILIPPINES

**John Bardey, vice president, Banguet Consolidated recently reported that positive ore reserves of Benguet and its subsidiaries totalled over $20-million at**

# No Guesswork When Laboratory Crushing or Grinding is Done by Sturtevant Machines

### "Open-Door" Design Provides Quick Access for Cleanout — Guarantees Accurate Samples

Sturtevant Automatic Coal Sampler at Con Edison's Laboratory (New York). Sturtevant Bulletin No. 85 describes this machine.

In a matter of seconds, because of hinged access doors, all crushing or grinding parts are exposed for thorough cleanouts — 100% accuracy in sampling.

Design of Sturtevant laboratory machines is based on production models. Higher output — to scale with actual production quality and output, is built into each machine. Add rugged construction and you have a machine that keeps on top of lab or pilot work.

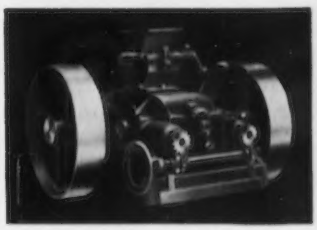
Preferred by laboratories that demand accuracy and dependability in test or pilot runs, Sturtevant laboratory machines have long been used by the 'blue chips' of industry and education. Names on request.

Send for Bulletin 067, which gives full description of all Sturtevant laboratory machines. (Bulletins are also available on Production Crushers, Grinders, Blenders, Air Separators, Micronizers and Automatic Coal Sampler.) Write Sturtevant Mill Company, 101 Clayton St., Boston 22, Mass.

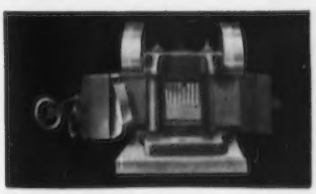
### SWING-SLEDGE MILL RETIRES AFTER 25 YEARS...

Ruggedness of Sturtevant machinery is well-known in industry, where even laboratory-size Sturtevant units are sometimes used for round-the-clock production.

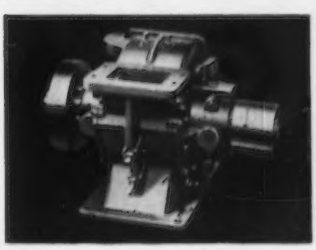
Jas. F. Morse Co., Boston, recently replaced their small-size Swing-Sledge Mill, which had been doing production grinding for 25 years. It was used to grind ⅝ in. tankage into bone meal. Repairs in 25 years? "Just grates and hammers," reports Plant Manager W. Carleton Merrill.



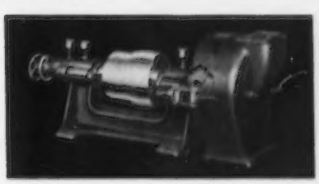
**Lab Crushing Rolls:** Specially designed for laboratory sampling, Crushing Rolls come in two sizes: 8 x 5 in. and 12 x 12 in. Capacities run as high as 10 tons per hour. Automatic adjustments: 8 x 5 in. model adjusts from ½ in. to 20 mesh; 12 x 12 in. model from ¾ in. to 20 mesh. Tires are high carbon forgings and extra tough. Feeder is automatic, adjustable.



**Lab Jaw Crusher:** Full or part-time duty for crushing hardest rocks: 2 x 6 in. opening Jaw Crushers have roll jaw action — no clogging. Hard rock capacities: ½ in. setting — 1900 pounds per hour; ¼ in. setting — 1200 pounds per hour; ⅛ in. setting — 800 pounds per hour. Instant in-operation adjustment. Jaw Crushers have manganese steel jaw plates, reversible shields, steel pitman, anti-friction bearings.



**Lab Swing-Sledge Mill:** 5 x 6 in. feed opening takes soft, medium, tough or fibrous material. Capacity to 1 ton per hour, fines regulated from 1 in. to 20 mesh. Single-pass limestone grinding produces 99.8% 10 mesh fines, 95.8% 20 mesh. Single-pass bituminous coal pulverizing gives 99.9% 10 mesh fines, 91% 20 mesh. Choice of gratings, hammers (or knives).



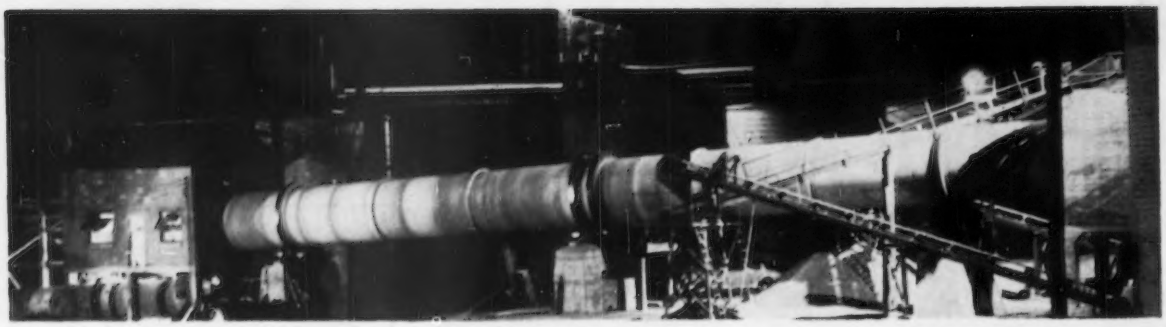
**Sample Grinder:** Disc type grinders for dry, friable, soft or medium materials. Three sizes — 6 in., 10 in. and 14 in. take feed as coarse as ¼ in. 100 mesh fines at rates to 200 pounds per hour on largest model. Product regulates from 10 to 100 mesh. In-operation adjustment.

# STURTEVANT

## *Dry Processing Equipment*

**The "OPEN-DOOR" to *lower* operating costs over *more* years**

CRUSHERS • GRINDERS • MICRON-GRINDERS • SEPARATORS
BLENDERS • GRANULATORS • CONVEYORS • ELEVATORS



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We design and manufacture
ROTARY KILNS
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NEW HIGH EFFICIENCY DUST COLLECTOR

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**MAYO**
**PNEUMATIC GROUTER and "PEA SHOOTER"**

The Mayo Pneumatic Grouter has performed capably on jobs ranging from tunnels, mines, and shafts to foundations and railroad subgrades. Simple and efficient in operation, it may also be used for injecting chemical soil stabilizers into caving or running ground.
For grouting back of lagging in rock tunnels or back of liner plates in soft ground, the Mayo Grouter is readily converted to a "Pea Shooter" for shooting Pea or "Bird's Eye" gravel.
The Mayo Pneumatic Grouter has no moving parts within the Grout . . . gives years of trouble-free service. Shop tested to twice working pressure. Capacity: 3½ cu. ft., charging height: 3 ft.

*For complete details and specifications, write for Free Bulletin 13*

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**TUNNEL & MINE EQUIPMENT**
**LANCASTER, PA.**

Steel Forms
Headframes
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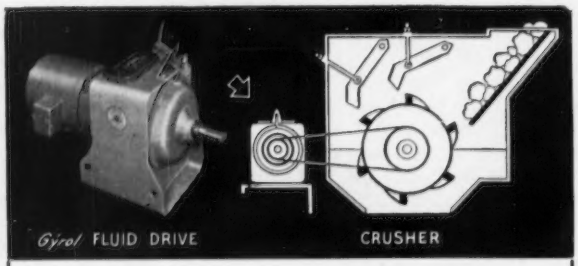

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**PREVENT DAMAGE TO CRUSHER SHAFTS AND MOTORS WITH *Gyrol*® FLUID DRIVE**

The high stress peaks that damage input shafts and burn out motors on crushers can be cushioned by Gyrol Fluid Drive. A Gyrol unit acts as a liquid shearpin that slips when a sudden stoppage occurs. And you get no-load starts, too, to prevent burning out motor windings.

Is your equipment subject to sudden shocks or overloads? Then get adjustable speed . . . smooth, no-load starts, cushioned power with a Gyrol Fluid Drive. Call our nearest branch office for full data; or write American Blower Division of American-Standard, Detroit 32, Michigan. In Canada: Canadian Sirocco products, Windsor, Ontario.

**AMERICAN BLOWER**
Division of AMERICAN-Standard

*When choosing your shovel feeder cable...*

# How much of a choice do you really have?

**HIGH RESISTANCE TO MOISTURE** is just one of the benefits you get with Rome's portable shovel cable. This tough cable—available with *both* oil-base and butyl-base insulations—provides long-life service under the most severe conditions.

Shovel cable may *look* alike . . . but you can find as many differences in cable as you can in mining operations. And your particular kind of operation deserves the one best cable.

That's why it's so important to choose your Type SH-D cable from a manufacturer who can offer you an unbiased recommendation as to the proper insulation for your own application.

**Your choice of insulations.** Rome Cable is one of only three major companies now making *both* butyl-base and oil-base insulations. This means you can describe your mining conditions to a Rome representative and get the one *right* insulation for your feeder cable. No matter what you want most in your cable—maximum resistance to heat, moisture, or ozone resistance—you can be sure of your choice when the cable is made by Rome Cable.

**Tough jacket, too.** Feeder cable takes a beating in most open pit mines, so you naturally want to choose a cable that's tough. Rome's mold-cured Rome 60 (neoprene) jacket provides maximum resistance to abrasion and crushing . . . and it's ideal for use in either wet or dry locations.

**Choose carefully.** No matter what type of shovel cable you need, take advantage of Rome's ability to offer you a *real* choice of insulations. When you present your shovel cable problems to your nearest Rome Cable representative, you can be sure he'll recommend the *right* cable—not just the best his company can provide. Contact him for more information—or write to Department 530, Rome Cable Corporation, Rome, New York.

**ROME CABLE**

CORPORATION

**WEIGH** WITHOUT STOPPING

WHILE YOU **CONVEY**

*Yes, weigh and record with the —MERRICK*

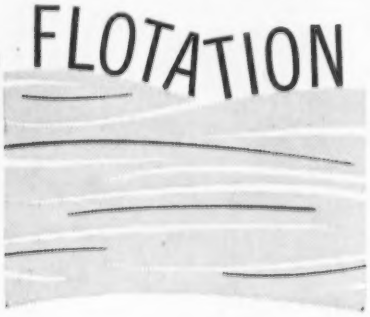
**WEIGHTOMETER**

The Merrick Weightometer provides a continuous, automatic, accurate weight record at any designated point in a mill, while material is in motion on conveyor. It weighs without interrupting conveyor service. Applicable to any size belt conveyor, horizontal or inclined. An accurate and dependable means of keeping constant check on production.

**MERRICK** SCALE MFG. CO. PASSAIC N. J.



**PQ SILICATE AIDS TO FLOTATION**



Here's how PQ silicates boost recovery of metallic oxide and non-metallic minerals (often as much as 10%).

- as gangue depressant
- as dispersing agent for siliceous and iron oxide slimes
- as a surface conditioner
- as a corrosion inhibitor for pipes

*YOUR FURTHER INQUIRIES ARE INVITED.*

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1135 Public Ledger Bldg., Philadelphia 6, Pa.
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PQ SOLUBLE SILICATES

9 PLANTS • DISTRIBUTORS IN OVER 65 CITIES


## Philippines *(Continued)*

$35 gold. Chrome ore reserves were valued at $5.4-million. New ore discoveries have been located by Benguet geologists on Palawan Island indicating deposits of chrome ore and titanium.

Earnings from the Masinloc chromite deposit should total $2-million in 1957. Shipments are averaging 50,000 tons a month, and comprise about 85% of all imports of metallurgical chrome into the U.S.

A market has been developed for the fines heretofore left behind as unsalable. Some possibility exists for manufacture of ferrochrome direct from the present refractory grade of chrome ore.

However like many other gold mining companies in U.S. and Canada Benguet has entered into a diversification program to employ more effectively its large cash resources. Its first project has been the United Finance Corp. for financing new business enterprises in the Philippines. Company official estimated 1957 earnings for Benguet would be 25% larger than in 1956.

**Atlas Consolidated milled 241,838 tons in June,** an average of 10,516 tons per day, and produced 6,087 tons of concentrates. Copper content totalled 3,123,794 lb metal., valued at $887,500. This established a new record for the Toledo mine. Millheads rose to 0.75% Cu. Late in the month production fell off because of power failure, otherwise output would have been larger. New transformers were ordered from Japan.

**Lepanto Consolidated had a June production of 2,439,800 lb copper** in concentrates from milling 35,569 tons of ore. Copper content averaged 3.57% with a gold content of 0.134 oz per ton.

**In May, Mindanao Motherlode mined 7500 tons of ore averaging 2.57% Cu.** Overall recovery was 90.2%. Production value for the month was estimated at $156,200.

# IN ASIA

## MALAYA

**A substantial drop in Malayan tin production has taken place during 1957,** despite the fact that the price of tin has varied but little, says the Quarterly Bulletin of Statistics of the Mining Industry.

Average assay of domestic tin concentrates for the period January-June 1957 was 75.27% and it will therefore be appropriate to continue to use a value of 75.3% for the rest of the year, states the Bulletin.

There were four more tin mining units at work at the end of the second quarter than at the end of the first quarter. Production for the second quarter, at 14,402 tons metal content, was 378 tons less than for the first quarter and 1,536 tons less than for the second quarter of 1956.

**Malayan production of tin concentrates in June amounted to 4,692 tons.** At the

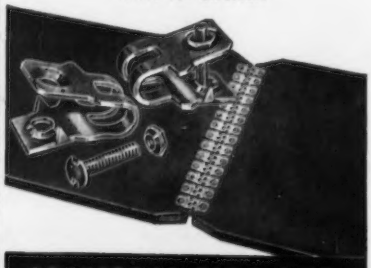

**HINGED PLATEGRIP**
**BELT FASTENER No. 500**

**FOR HEAVY CONVEYOR BELTS OF CHANGING LENGTH**

These heavy duty belt fasteners make a strong, flexible joint in conveyor belts, belts of any width and of from 3/8" to 1/2" thickness. They offer special advantages in mines, quarries or industrial setups where length or position of belt is frequently changed, because sections can be removed or added at will. Joints are opened for this purpose by simply pulling out the hinge pin.

Easily and quickly applied on the job or in the shop. Special design gives deep compression into belting and smooth, flush joint.

*Write for Circular.*



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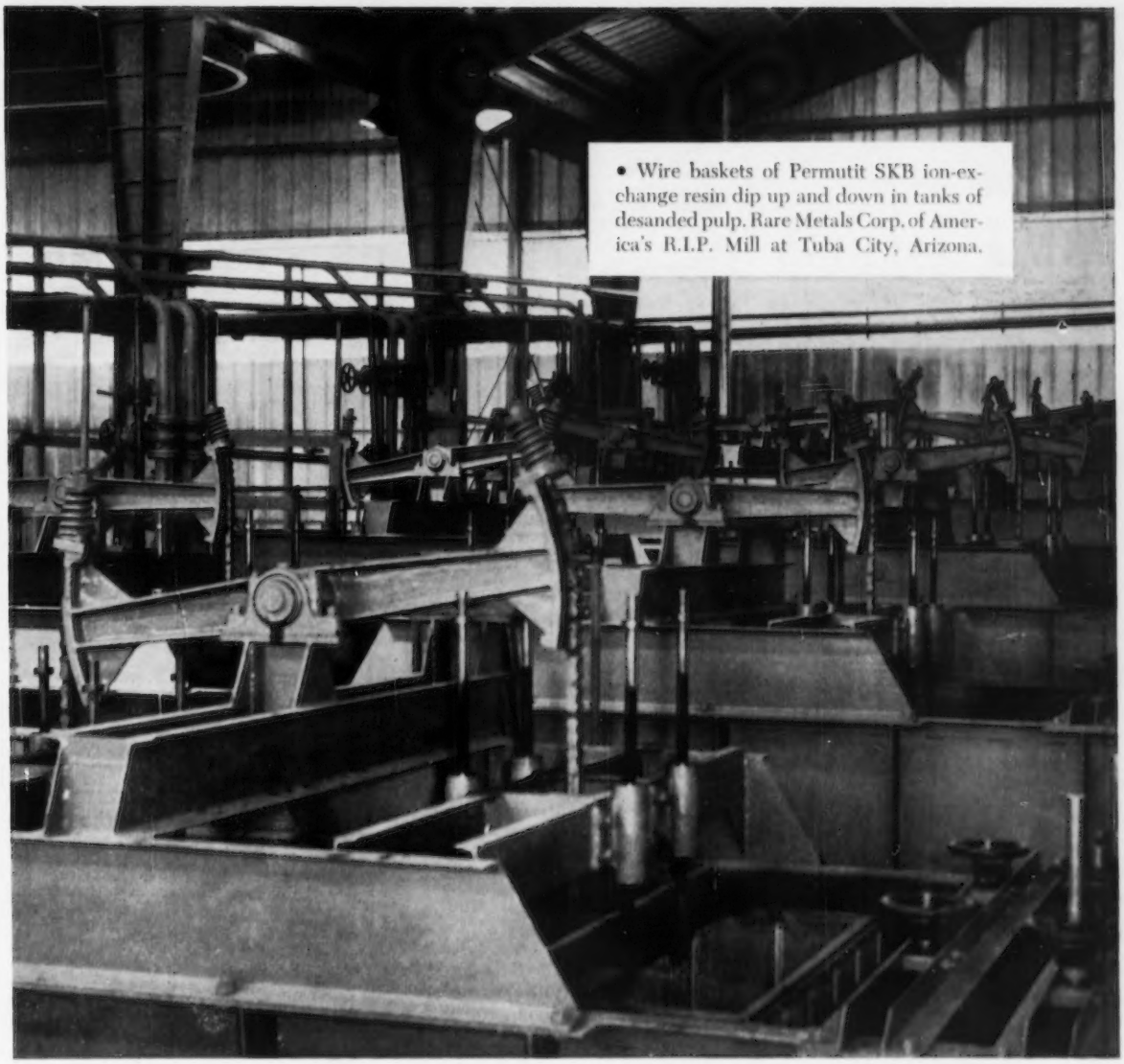

• Wire baskets of Permutit SKB ion-exchange resin dip up and down in tanks of desanded pulp. Rare Metals Corp. of America's R.I.P. Mill at Tuba City, Arizona.

# How Rare Metals licks a "tough" uranium pulp with Permutit SKB resin

• Rare Metals' ore produces a hard-to-handle clay slime pulp difficult to contact with resin. This pulp is also high in molybdenum and other ions that make it necessary to "restore" the resin periodically with a caustic-nitrate solution that is hard on most resins.

In spite of these difficulties, Permutit SKB is showing fast loading and high capacity . . . as high as 3½ or 4 lbs. $U_3O_8$ per cu. ft.! Resin losses are low. And production exceeds the design capacity of the plant!

A number of R.I.P. Mills use Permutit SKB for these same reasons. It was specially developed for R.I.P. extraction. It has high uranium capacity and fast elution, for higher production and lower precipitation costs; and it has excellent durability to resist chemical or physical breakdown.

Permutit SK (finer mesh than SKB) offers the same advantages in ion-exchange columns.

We'll supply full details and samples to help you evaluate Permutit SK, SKB or other ion-exchange resins. Write: The Permutit Company, Dept. EMJ-9, 330 W 42nd Street, New York 36, N. Y. or The Permutit Company of Canada, Ltd., Toronto 1, Ontario.

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## Malaya *(Continued)*

end of the month there were 77 dredges, 601 gravel pump mines and 67 other tin mines in operation making a total of 745 active tin mines.

May production was 4,847 tons.

## JAPAN

**Simpler and more efficient titanium refining process** has been developed at Sendai by Prof. Sakae Takeuchi. Dr. Takeuchi, of the Tohoku University's Metallic Materials Research Institute, used titanium tetrachloride as raw material for his process, reportedly a continuous refining operation. Mineral obtained as waste in sand iron refining, is mixed with magnesium in gas form and forced into a vacuum reaction tower heater which produces heat up to about 1000 deg C. Titanium metal results.

**Joint Japan-Canada steel mill might be formed in British Columbia.** Shigeru Kawada, head of the visiting Japanese steel mission, said that government officials and private Canadian businessmen showed interest in a joint venture similar to the Japan Brazil steel mill project that will be built at Minas Gerais, Brazil.

## INDIA

**Official red-tape and the commercial inexperience of the State Trading Corp. (STC) is threatening to lose India her valuable iron-ore market in Japan.**

The Japanese are getting anxious over the delays in deliveries which have occurred in the supply of iron-ore contracted for during the year with the STC. Indian officials attribute them to current transport bottlenecks.

# IN EUROPE

**On the island of Mykonos, Greece, Magnet Cove Barium Corp. is about to open a modern barite drilling mud processing plant.** Part of Dresser Industries worldwide oil processing supplies structure, the new project will be the first major productive industry in the island's history.

**Near Rome, Italy, Vitro Engineering Co., division of Vitro Corp. of America,** will construct a 500,000 kw (thermal) nuclear reactor for Societa Italiana Meridionale Energia Atomica an operating subsidiary of AGIP Nucleare. Certain major components of the power station will be purchased in the U. S. Other components and services will be procured in Europe wherever advantageous to the project. Total cost of the project will be $46-million. Start-up is scheduled for early 1962.

**Sardinian zinc production will be treated in a new electrolytic zinc plant** proposed for the island to Cassa per il Mezzogiorno (Italian Government Agency). Proposal calls for the production of 15,000 metric tons of electrolytic zinc a year. Plant will be built and managed by Zincovesme Co. and will employ about 600 workers. Construction cost will be about $4-million.


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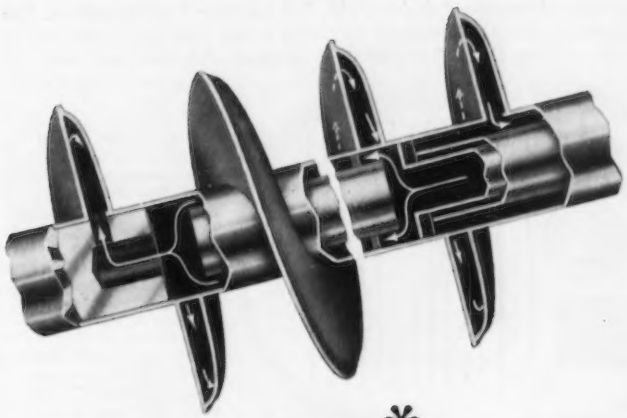

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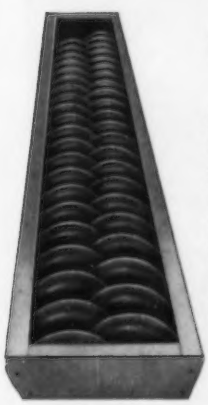

## *what* IT IS!

Basically the HOLO-FLITE consists of two or more flights of hollow-bladed screw conveyors. The product to be processed moves in a trough around the conveyor screws. The heat-transfer fluid circulates through the hollow blades and shafts of the conveyor. The product is constantly rotated into, around, under and over the blades and shafts through which the heat-transfer fluid is circulating, assuring quick, uniform heat passage between the two mediums—*as the product is continuously moved along in a bulk-flow without interruptions!*

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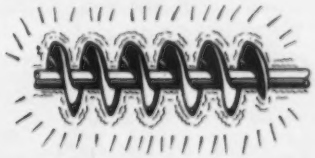

**ITS LARGE HEAT-TRANSFER SURFACE** requires far less space—as little as 1/5th the space required by other heat-exchange equipment. Further, flights can be "stacked" as high as desired to save floor space, simplify installation!

**ITS SLOW ROTATION IS SO GENTLE** that granular and powdered solids are handled with no dusting—little or no particle abrasion. Result—no dust recovery problems... simple, inexpensive installation.

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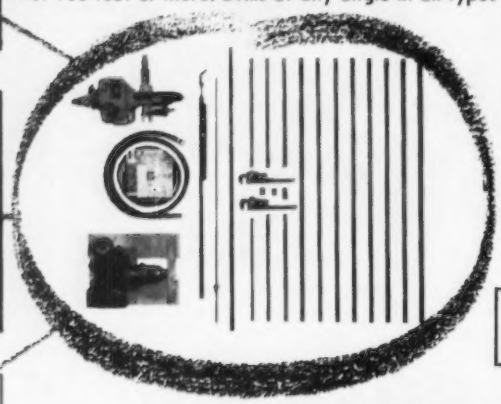

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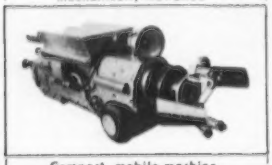

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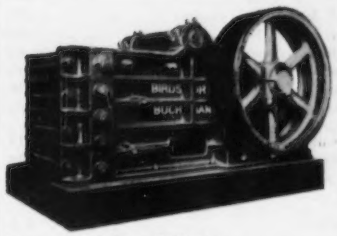

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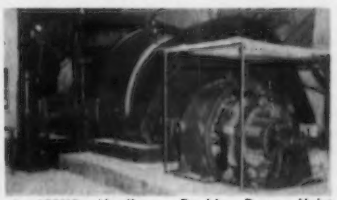

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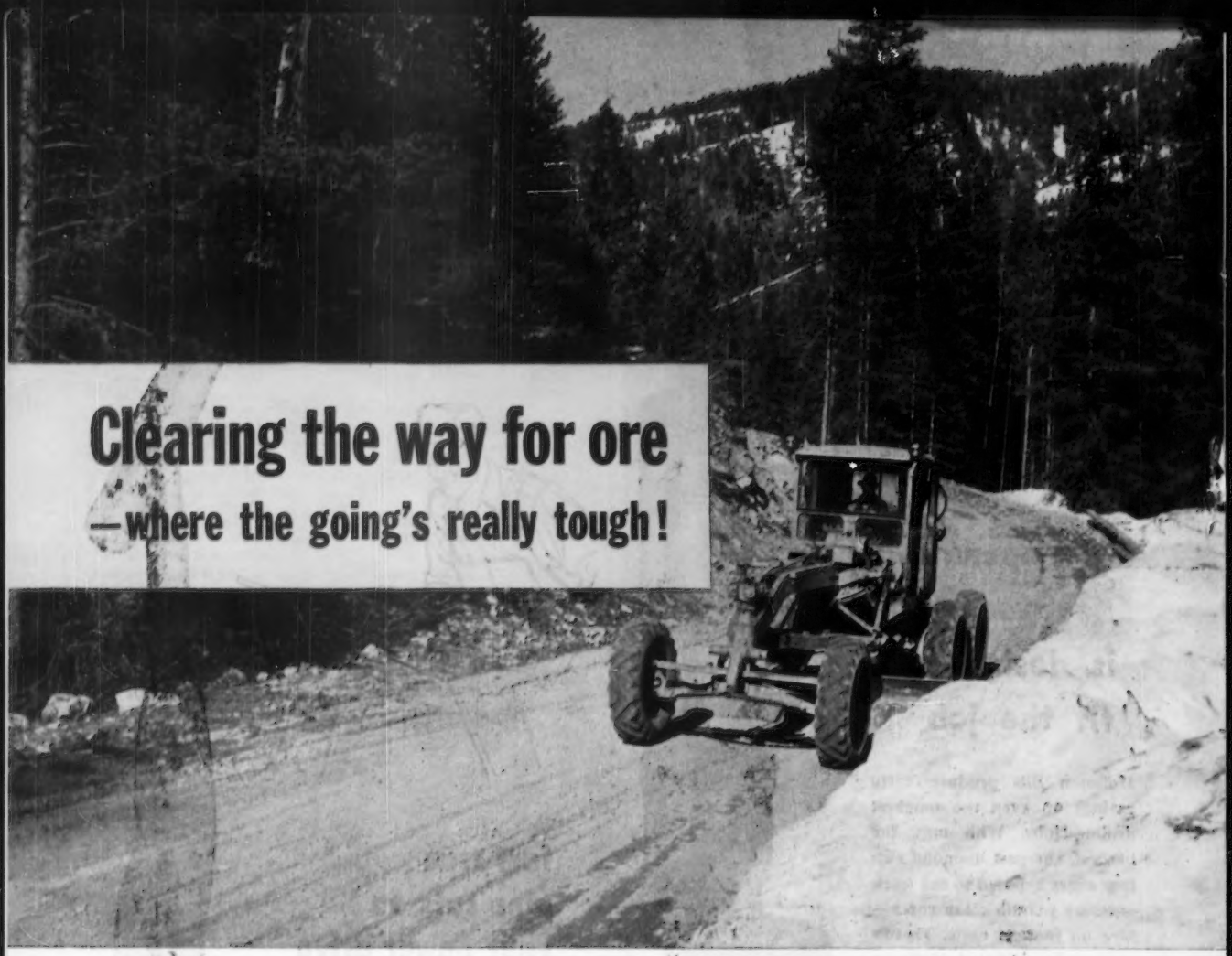

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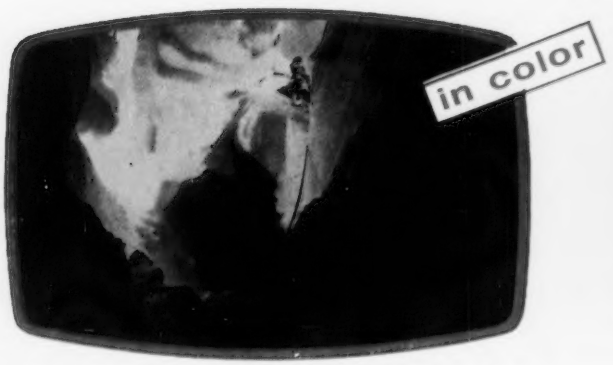
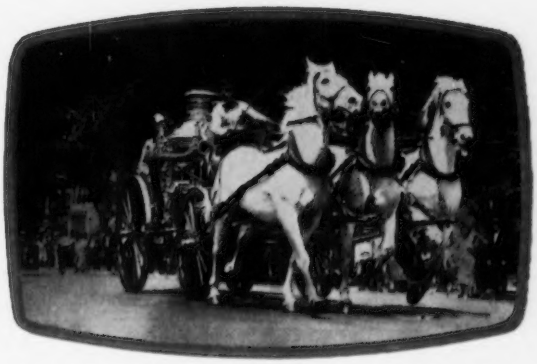



**Over 126 NBC STATIONS, SEPTEMBER 23rd**

**"Eleven Against the Ice"**, the story of the Antarctica Turnpike. See men and machines build a trail across Antarctica's frozen wastes—in spite of 200 mph winds, temperatures of 120 degrees below zero and crevasses big enough to swallow a 20-story building. It's a triumph of engineering and human courage, a whale of a television show.



**Over 142 NBC STATIONS, NOVEMBER 21st**

**"The Innocent Years"**. Recaptured from exciting old films and newsreels, you'll see happy days relived. Experience the excitement of "Teddy" Roosevelt, Thomas Edison and Mark Twain in action. Hear songs like: "In the Good Old Summertime", "He'd Have to Get Out and Get Under". Enjoy the fun of family picnics, the joys of people in the last untroubled time in our history.

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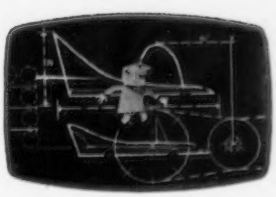
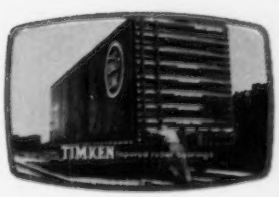
**See** How man stumbled on the concept of the wheel.

**See** Why America's railroads have always led the world.



**See** Why Americans jump for the latest thing in cars.




**See** One man push a freight car all by himself.

Years of national and trade advertising, backed by their superior performance, have made "Timken" the best-known name in bearings—a name that helps to sell the products that use Timken® bearings. Now, network television will build even a greater awareness of Timken bearings—make them an even bigger sales plus in the equipment you sell. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

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